The FOUNDRY

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Editorial

Extend Greetings to British and International Congress

TO THE Institute of British Foundrymen, organizer of the International Foundry congress to be held in London, June 12 to 17, THE FOUNDRY joins with all American foundrymen in extending greetings and best wishes for a most successful and beneficial meeting. May the valuable work of the International Committee of Foundry Technical associations in improving world foundry practice, exchanging ideas on a constructive basis, and co-operating in the development of industry and commerce continue to promote good will and international understanding for many years to come.

Foundrymen on this side of the Atlantic are particularly gratified in the awarding of the E. J. Fox gold medal by the Institute of British Foundrymen to Dr. Harry A. Schwartz, National Malleable & Steel Castings Co., Cleveland, for "his outstanding services in the development of malleable castings." Dr. Schwartz was the recipient of the John A. Penton gold medal of the American Foundrymen's association in 1930. This new honor, conferred by the I.B.F. on occasion of an International Foundry congress, is a splendid tribute to a brilliant American whose contributions have been of material benefit to world foundry progress.

Convention Points Future Path

SUCCESS of the recent Cincinnati convention of the American Foundrymen's association, as attested by the record attendance, interest in the various sessions and committee meetings, participation in the plant visitation program, and in many other ways, should prove exceedingly gratifying to all members of the association, and especially to the officers, directors and the staff at national headquarters. Records set 12 years ago at the Edgewater Beach hotel in Chicago have been broken and future conventions staged without a foundry show must aim at the high standards established in the Queen City.

Credit for success of the meeting must be distributed in generous measure. Members of the youthful Cincinnati District chapter of the A.F.A. should take considerable pride in the variety of well planned and beautifully completed entertainment features. Authors of papers, chairmen of meetings, special speakers, association committee members participating in the various phases of the program, and the home office staff members deserve the sincere appreciation of all convention visitors.

Undoubtedly the feature of the convention was an attendance in excess of 1500 drawn from every section of the United States and with a sizable delegation from Canada. Surely such an interest in the technical and practical phases of foundry practice bespeaks a healthy industry bent on applying tomorrow the latest developments of today. Conversations with many convention visitors revealed an exceedingly spotty condition in the industry, with a sizable number of companies operating at capacity or at a high rate. Most of those less fortunate at present anticipate some improvement as the year moves along.

Tax Revision Is Possible

IN A RECENT speech, President Roosevelt served notice that business can expect no compromise with new deal principles of heavy taxation. Regardless of the fact that time has proven the unsoundness of so called pump priming, mounting deficits and increasing taxation, the administration refuses to change its economic thinking to meet aggravated conditions of today. Therefore, business must cease anticipating co-operation from the President, and concentrate its efforts on the Congress.

Senators and Congressmen seem anxious for suggestions from the folks back home in revamping present tax laws. Congress is ready to move, but action still depends on the expression of public opinion. For that reason, every executive and every worker with an interest in this vital subject, should communicate at once not only with their own representatives but also with members of the Senate Finance committee and the House Ways and Means committee.

Recent report of the Brookings Institution coupled with the apparent willingness of one faction in Washington to go along with business, may bring results if backed by popular demand.

Frank G. Steinebach
Editor

Cincinnati

Henry S. Washburn
President of A. F. A.

Lester N. Shannon
Vice President of A. F. A.

CINCINNATI convention of the American Foundrymen's association, held May 15 to 18, attracted greater attention than any previous meeting of that organization devoted entirely to the technical and practical phases of the foundry industry. A total of 1316 members and guests passed the headquarters desk at the Hotel Gibson and 150 ladies were registered at their headquarters in the Netherland Plaza hotel. Considering some who failed to register, total attendance for the convention was well in excess of 1500. Every section of the country was represented at the meeting.

Warm appreciation for the hospitality of Cincinnati foundrymen was conveyed by President Marshall Post in the formal ceremonies which marked the first session of the 43rd annual convention. He touched upon the legitimate pride of Cincinnati, one of the first settlements of the Northwest Territory to adopt a comprehensive law for the planning and development of streets, bridges and parks. Today with over a hundred parks, Cincinnati is one of the leading urban beauty spots of America.

Following a reference to the development of the foundry industry through the centuries he pointed out that the American Foundrymen's association was one of the first great industrial organizations formed in this country and one that ever has been in the vanguard of national and social advancement.

George A. Seyler, Lunkenheimer Co., and general chairman of the Cincinnati committee of arrangements, explained the features of the program. J. G. Stewart, mayor of Cincinnati, in a witty and colorful speech welcomed the visitors. In a more serious mood he trusted the convention would be a factor in restoring business stability and prosperity. That it would play a part in bringing back conditions in which every man would have the opportunity in carving out his own destiny instead of being an object of charity or the member of an army depending on the dole disguised under any form of temporary employment.

Before adjournment President Post announced the following prenominating committee to select the nominating committee: L. E. Everett, Key Co., St. Louis, chairman; C. E. Westover, Burnside Steel Casting Co., Chicago; and H. W. Dietert, Harry W. Dietert Co., Detroit.

Directed by Philip H. Cone, assistant general manager and staff of 72 guides, more than 500 individuals visited the plant of the Cincinnati Milling Machine Co., on Monday afternoon. Ten busses accompanied by a police escort were used to transport visitors inspecting various operations in the three plants of the firm which occupy 17 acres of floor space. Special interest was displayed in the foundry division under the supervision of Herman K. Ewig, foundry superintendent, which was on regular schedule of operations. Each visitor was presented with a 12-page souvenir program of the occasion. The various other plants open for visitation entertained numerous convention visitors on the 4 meeting days.

Annual dinner meeting of engineering instructors was held Tuesday evening, with Frederick G. Sefing, International Nickel Co., New York, presiding. In opening the meeting the chairman pointed out that similar gatherings had been held since 1924 and that the activity had done a great deal of good, not only in getting the instructors better acquainted,

Convention Attracts Widespread Attention

but also in promoting A.F.A. activities. Mr. Sefing expressed the opinion that the A.F.A. handbook and co-operative research with numerous colleges have been furthered greatly by the annual instructors' meeting.

R. E. Wendt, Purdue university, West Lafayette, Ind., presented a paper on "School Snop Courses" which provoked an interesting discussion. R. R. Deas Jr., American Cast Iron Pipe Co., Birmingham, outlined the program followed by his organization in selecting and training engineering college graduates. The instructors also considered methods of increasing the interest of engineering students in the work of the A.F.A. and the possibility of the association interesting a greater number of foundry executives in hiring and training college graduates for future leadership in the industry.

Annual dinner conference of chapter delegates was held on Tuesday evening with Henry S. Washburn, vice president of the A.F.A. presiding. Many problems relating to the financing and operation of the chapters were discussed by the various delegates. Interesting talks also were made by Marshall Post, president of the A.F.A. and Lester N. Shannon, vice president elect.

The annual dinner of the association was held in the Roof Garden of the Hotel Gibson on Wednesday evening with Marshall Post, presiding. The W. H. McFadden gold medal was awarded to Donald James Campbell, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich. by Hyman Bornstein, Deere & Co., Moline, Ill., and past president and chairman of the board of awards. The award was accepted by George W. Cannon, vice president, Campbell, Wyant & Cannon Foundry Co. in the absence of Mr. Campbell. The John A. Penton gold medal was awarded to Harold Sands Falk, vice president and general manager, Falk Corp., Milwaukee, by Gen. T. S. Hammond,

Chambers R. Culling

Fred J. Walls

Otto A. Pfaff

Marshall Post

William B. Coleman

Whiting Corp., Harvey, Ill., and past president and member of the board of awards. The J. H. Whiting gold medal was awarded to James Ramsay Allan, assistant manager of the engineering and construction department, International Harvester Co., Chicago by E. H. Ballard, General Electric Co., Lynn, Mass., and past president and member of the board of awards.

Official greetings of the Institute of British Foundrymen, the British Cast Iron Research association, the Iron and Steel institute and the Staffordshire Iron and Steel institute were conveyed by J. E. Hurst, Bradley & Foster Ltd., Darlston, England and past president of the Institute of British Foundrymen. Mr. Hurst also announced the E. J. Fox medal of the Institute of British Foundrymen has been awarded to Dr. Harry A. Schwartz, National Malleable & Steel Castings Co., Cleveland, for his outstanding services in the development of malleable castings. Presentation of the medal will be made during the coming International congress in London.

Extensive Program Enjoyed by Ladies

A reception and dance following the banquet provided a number of unusual features. The party was arranged by a committee of the Cincinnati District chapter under the direction of Herman K. Ewig, Cincinnati Milling Machine Co. Various features of ladies' entertainment, arranged by a committee headed by Ray T. Redmond, Buckeye Foundry Co., were enjoyed by the 150 ladies in attendance at the convention. The ladies' entertainment included a tea at the Netherland Plaza hotel on Monday, a visit to the Taft museum and bus trip through the city on

Many plants in the Cincinnati district were visited by those attending the convention. These views show a few of the 500 who inspected the Cincinnati Milling Machine Co. on Monday afternoon. Illustrations courtesy that organization

Tuesday morning, a luncheon at the Netherland Plaza hotel Tuesday noon and a ball game between the Cincinnati Reds and the Boston Bees in the afternoon. The group was taken to the Fox and Crow for luncheon and entertainment on Wednesday afternoon.

Annual business meeting of the association was held in the Roof Garden of the Hotel Gibson at 11 o'clock on Wednesday. The first portion of the meeting was devoted to reports of the officers and several committee chairmen, and the second part to the annual board of awards lecture presented by Fred H. Clausen, president, Van Brunt Mfg. Co., Horicon, Wis., President Marshall Post presided as chairman of the meeting.

Elects Five New Directors

C. E. Hoyt, executive vice president of the association, presented the annual report in which he outlined the various activities of the organization. Mr. Hoyt stressed the importance of the chapter movement and pointed to the probable future trends of association activities.

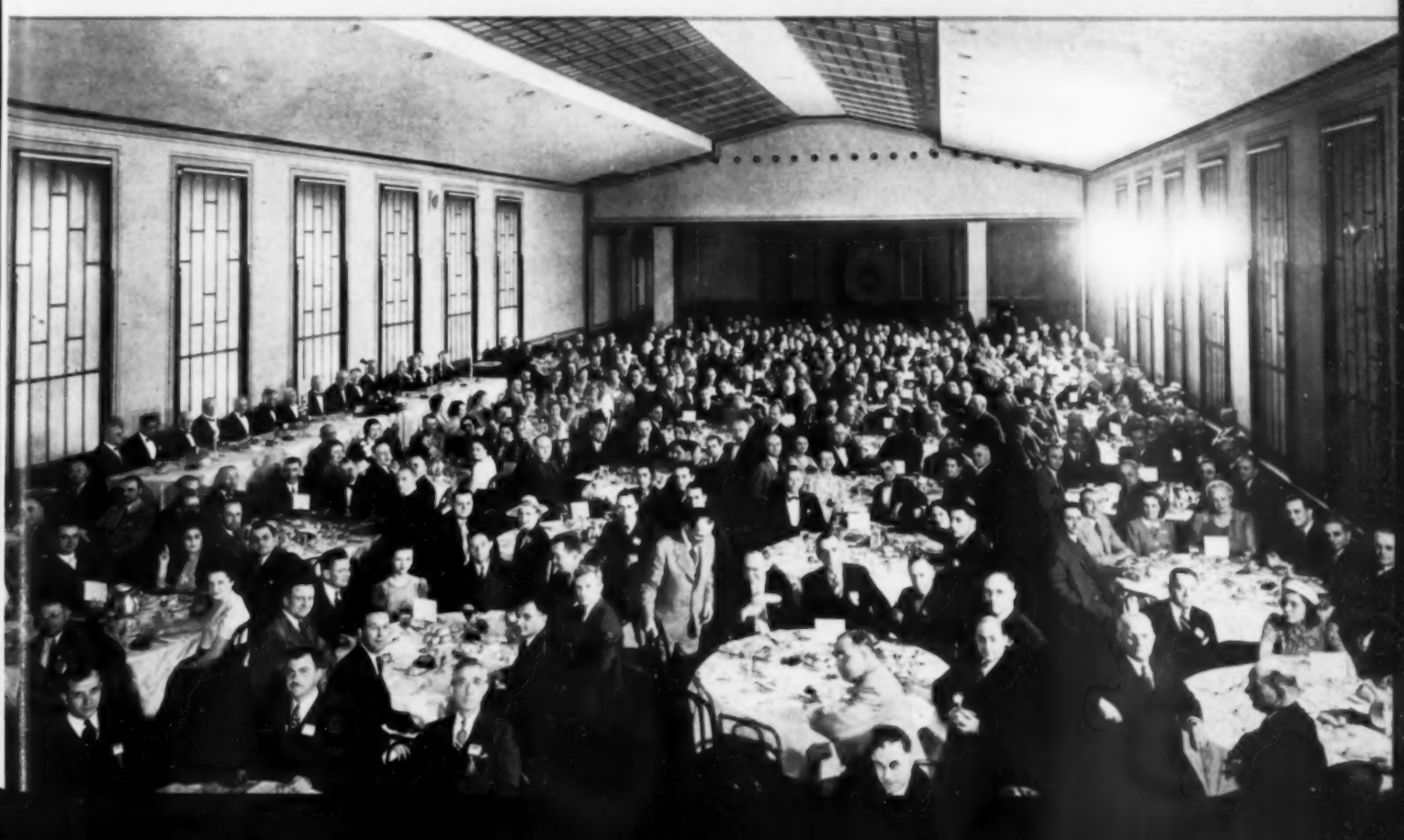
James L. Wick Jr., president, Falcon Bronze Co., Youngstown, O., and past president of the association presented the report of the nominating committee. Since no further nominations had been received, as provided in the by-laws, the secretary was instructed to cast a unanimous ballot for the following: President, H. S. Washburn, president and treasurer, Plainville Castings Co., Plainville, Conn.; vice president, Lester N. Shannon, vice president, Stockham Pipe Fittings Co., Birmingham; directors for 3-year term, William B. Coleman, president, William B. Coleman Co., Philadelphia; Chambers R. Culling, vice president and general manager, Carondelet Foundry Co., St. Louis; Otto A. Pfaff, vice president and general manager, American Foundry Equipment Co., Mishawaka, Ind.; Marshall Post, vice president, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.; and Fred J. Walls, manager of Detroit office, International Nickel Co. The chairman introduced the new officers and directors.

L. E. Everett, foundry superintendent, Key Co., East St. Louis, Ill., chairman of the prenominating committee presented the following selections for the nominating committee: W. H. Parker, American Steel Foundries, East Chicago, Ind.; M. J. Gregory, Caterpillar Tractor Co., Peoria, Ill.; Carl S. Joseph, Saginaw Malleable Iron division, General Motors Corp., Saginaw, Mich.; and J. W. Kelin, Federated Metals division, American Smelting & Refining Co., St. Louis. The following alternates were nominated: E. A. Walcher, Ohio Steel Foundry Co., Lima, O.; R. F. Harrington, Hunt-Spiller Mfg. Co., South Boston, Mass.; James H. Lansing, Malleable Founders' society, Cleveland; B. D. Claffey, General Malleable Corp., Waukesha, Wis.

Apprentice Prizes Awarded

A brief report of the International Relations committee was made by Frank G. Steinebach, editor, THE FOUNDRY, Cleveland, and chairman of that committee.

Norman F. Hindle, technical secretary, reported on the annual apprenticeship molding and pattern making contest. The following were the winners in the four divisions. First prize in each division is $40, second, $25, and third prize $15 *Steel molding:* First, Joe Birkenheuer, Crucible Steel Casting Co., Cleveland; second, Ivan Tudor, Continental Roll & Steel Foundry Co., East Chicago, Ind.; third, Gilbert Willms, Milwaukee. *Nonferrous molding:* First, Joseph Wyban, Gluntz Brass (*Please turn to page* 80)



More than 400 attended the annual banquet of the association which was held at Hotel Gibson

Iron Lining Fused To Steel

PRODUCTION of 20,000 to 25,000 automotive brake drums per eight-hour shift, current practice at the new plant of Centrifugal Fusing Co., Lansing, Mich., involves an interesting and unusual series of melting, handling and centrifugal casting operations. The drum, sold under the trade name of *Centrifuse*, is known as a combination type, with an outer shell or backing of pressed steel on the inner surface of which a high grade gray iron braking surface is cast centrifugally in such a way that it fuses into the steel shell. Drums are made in double units and cut apart after the braking surface is cast into the shell.

That type of drum was developed by Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., and the Motor Wheel Corp., Lansing, Mich. The fusing process and much of the machinery used in the fusing operations, as well as some of the steel fabricating methods and equipment, are covered by patents of the two companies.

Fusing operations on a production basis were started early in 1931 at the Muskegon plant of Campbell, Wyant & Cannon, operations in that plant being reviewed in the March, April and May, 1932, issues of THE FOUNDRY. Originally the pressed steel ring shells for the drum were manufactured by the Motor Wheel Corp., at Lansing, then trucked to Muskegon for fusing and the fused drums hauled back to Lansing for further fabrication. To eliminate that handling cost and to effect other manufacturing economies through new methods and equipment, Motor Wheel Corp. erected a new foundry at Lansing in 1936 and leased that plant to the Centrifugal Fusing Co. which took over the fusing operations in the new plant under licenses from Campbell, Wyant & Cannon. Fusing operations were started in the Lansing plant in the fall of 1937 and at that time were discontinued at Muskegon.

Normal output of the new plant is 10,000-12,000 double rings per 8-hour shift, each with average weight of 15 pounds. Naturally sizes vary somewhat, ranging from 2-inch flange by 10-inch diameter for passenger car use up to 3-inch flange by 16-inch diameter for trucks.

In describing the manufacture of these drums, it perhaps will be best to follow a drum through the sequence of operations involved, starting first with the pressed steel backing and then into the foundry phases. The backing material is hot-rolled steel strip, purchased in flat form and accurately sized as to length and width. For the smaller drums, 16-gage steel is used, and thickness ranges on up to ⅛-inch for the larger truck drums.

Each strip is of sufficient length to make two double drums. First step is to shear it into two pieces, after which each is passed through a set of rolls which form it to circular shape. The circular shape then is passed to the next machine in the fabricating line where the ends are electric welded along the seam. The weld is scarfed on both sides by a special machine, following which the piece is trued up for roundness and then expanded slightly before being rolled to obtain the proper section. A typical section embodies a single rib about ½-inch deep near what becomes eventually the outer edge, and a flanging over of the inner edge to permit subsequent drilling for attachment of the hub and backing plate.

In rolling the section, it is observed that no drawing of the steel takes place and the steel section is maintained uniform across the full width. After rolling, the drum is upset to within 0.001-inch on the diameter and is then washed by rolling through an inclined washing chamber to which a mixture of steam and alkaline cleaner is admitted under pressure. The drums then are ready to be trucked to the adjacent foundry building where the cast iron braking surface is applied. Two lines of machines are operated on forming the steel drums, each with capacity of 3000 pieces per 8 hours.

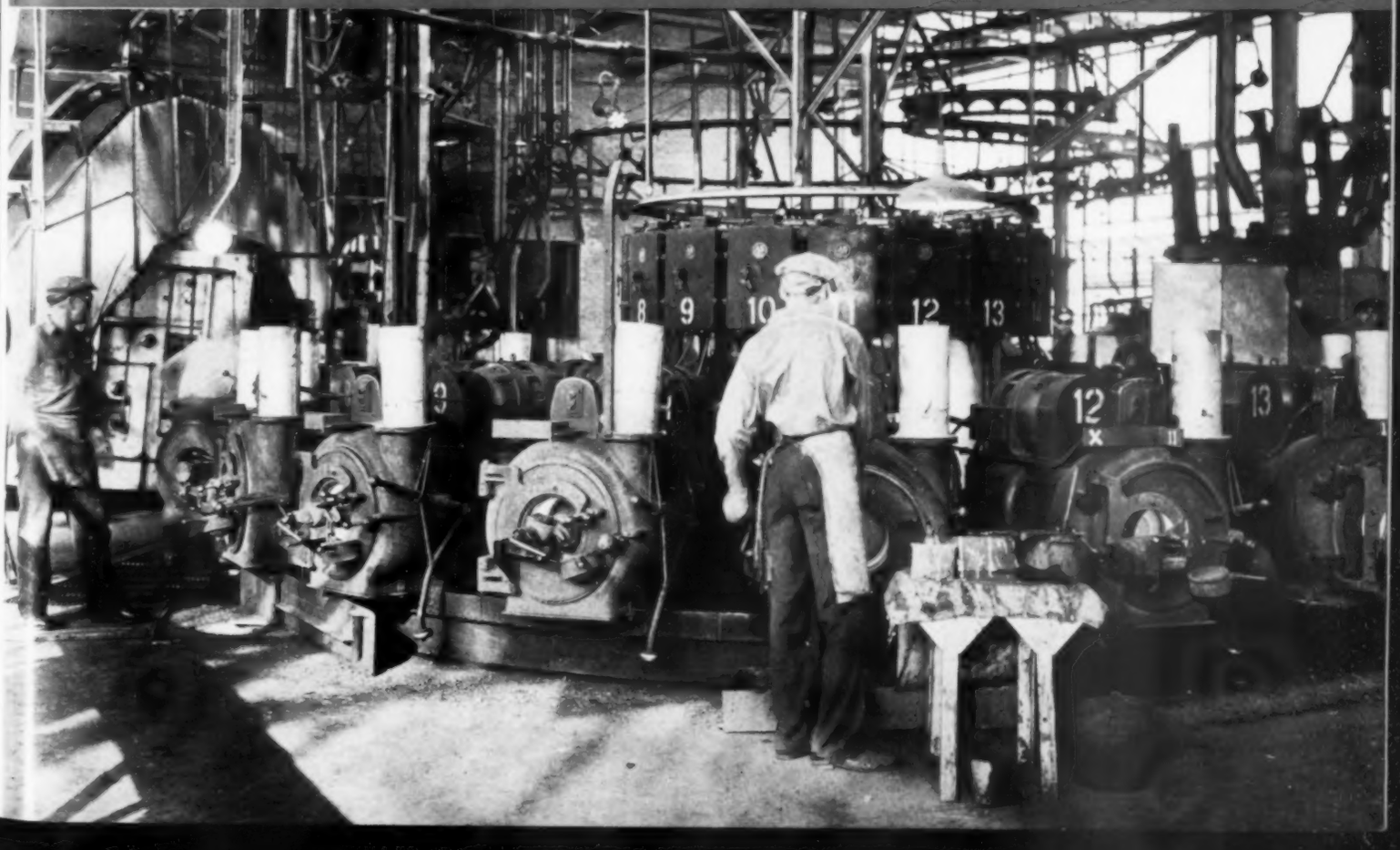
The foundry division proper is one of the few foundries in the world which has no core room, no molding machines, sand handling systems or related equipment. Iron requirements of 75-90 tons per day are supplied by two alternately operated 54-inch cupolas with auxiliary hot blast equipment supplied by the Whiting Corp., Harvey, Ill. The hot blast is stoker coal fed.

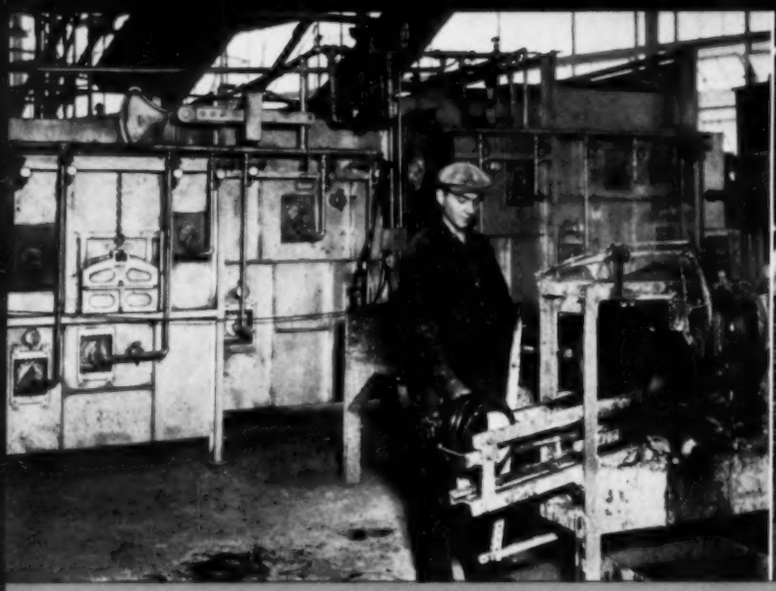
Charge is made up of coke, pig iron, steel plate clippings, foundry returns and a percentage of briquetted borings. Briquets are 4 inches in diameter, weighing 9 pounds, produced in an 1800-ton briquetting press manufactured by the Milwaukee Foundry Equipment Co., Milwaukee. The briquets are produced at a rate of about 550 per hour. The press has hopper feed

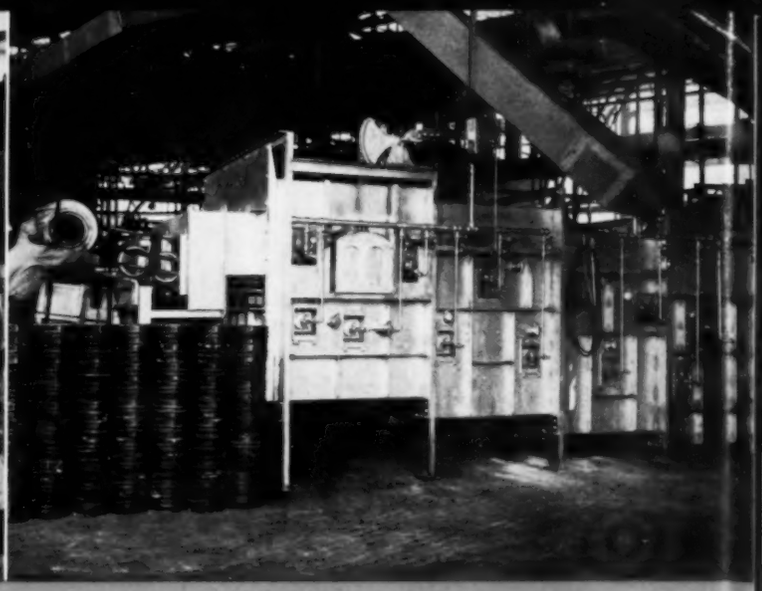
Fig. 1 (Left)—Molten iron from the electric furnace is transferred quickly to the runner box of the spinner. Note in the foreground the cam arrangement for closing the door of the spinner and tilting the runner box. Fig. 2 (Below)—General view of the turntable unit, with 18 spinners, which makes one revolution every three minutes. Spinners are air-cooled by fan blades cast integrally with rotating element

Shell Centrifugally

By
A. H. ALLEN
Detroit Editor
The Foundry







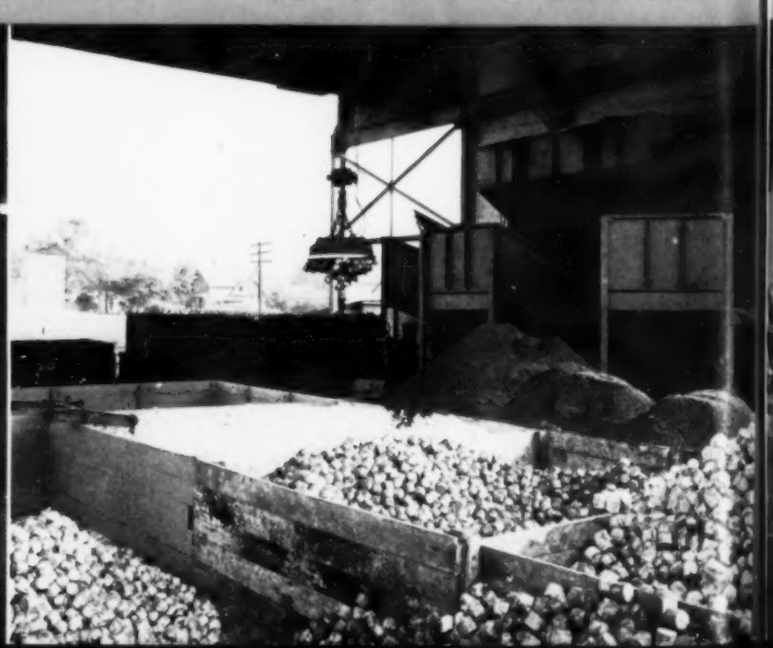
from outside storage bins, and is of the double-acting type, the charge being given an initial squeeze by two hydraulic cylinders on the side, followed by the action of the main center cylinder. A 125-horsepower motor drives a pump operating at 2000 pounds per square inch pressure to power the press. Borings are mixed with a small percentage of soda ash to offset the sulphur content of any cutting oil which might cling to them. The briquets finally are given a thin coating of cement to prevent oxidation before they reach the melting zone in the cupola. Fig. 6 gives a good idea of storage space available (about 60 days' requirements) for cupola charging materials. In the right background of that view may be seen the hoppers into which coke, pig iron, briquets, limestone, return scrap, etc., are placed by crane before being loaded into the charging bucket.

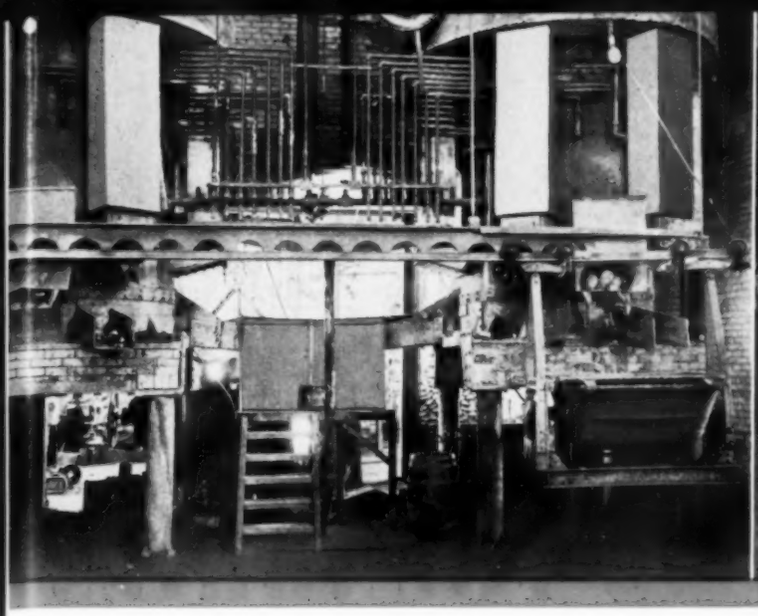
Fig. 10 shows the central discharge spouts of these hoppers and the 1-ton charging bucket and charging car on the scale platform. Briquets are handled into this bucket by belt conveyor from one hopper and a vibrating apron from another hopper. The bucket is moved along the track in the foreground to either of the two cupolas being operated; then is hoisted by overhead crane to a wishbone at the top of the cupola where the bottom drop is actuated and the charge admitted to the cupola.

Fig. 7 shows the charging and slagging side of the cupolas. Unusual feature of these melting units is the use of water jackets around their circumference at the melting zone. These jackets, of seamless welded steel, are curved to fit the contour of the inner cupola wall. They are about 3 inches thick, 30 inches high and 24 inches wide. Seven separate jackets or coolers are used in each cupola, each with separate water intake and discharge pipelines. Each discharge pipe is fitted with thermostatic control so that the degree of cooling can be regulated through the rate of flow of water in the jackets. The jackets are suitably finned on the inside so that maximum flow of water through them will be obtained, and the discharge water from the cupola is held at around approximately 120 degrees Fahr.

Primary advantage of the use of water jackets on the cupolas, which are positioned so their lower ends

Fig. 3 (Upper left)—Coating of liquid flux is applied to steel shells before iron is spun on the inner surface. Preheating furnace is in background. Fig. 4 (Upper right)—The fluxed steel shells roll in two lines down an inclined-hearth gas-fired preheating furnace before the spinning operations. Fig. 5 (Lower left)—An operator places a preheated steel band into the chuck of the spinner as it moves around to the pouring station. Fig. 6 (Lower right)—Ample undercover storage space is provided for briquetted borings, limestone, coke and other ingredients in the cupola charge. In the right background are hoppers which discharge the various materials to the weigh station and charging bucket





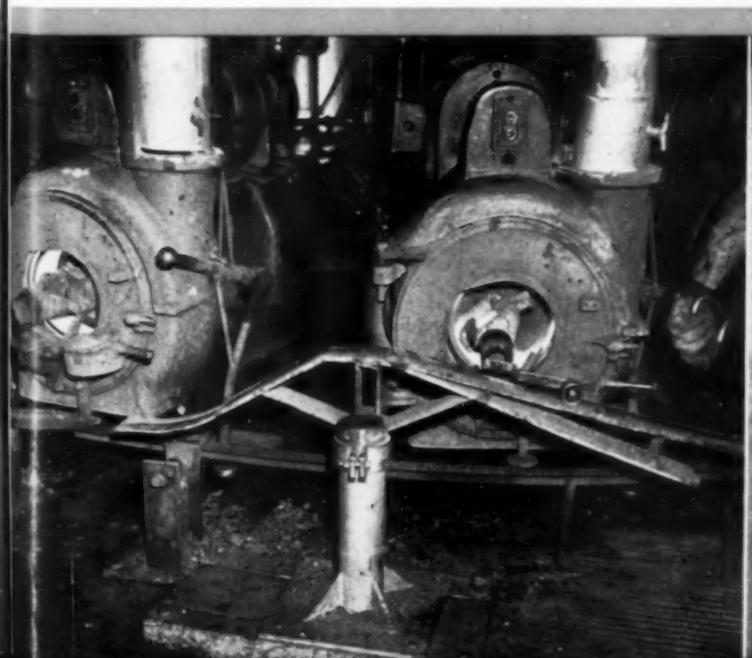
are just above the tuyeres, appears to be savings achieved on cupola refractories. Before the cupolas are charged, the jackets are covered with 1-inch thick splits of firebrick, laid up in the usual way. This is the only brick which needs to be renewed, after the bottom is dropped at the end of a run, whereas ordinarily without water jackets as much as 11 inches of firebrick may be consumed. Further, the use of water jackets makes possible much more uniform distribution of heat through the circumference of the cupola, and permits the cupolas to be run continuously for as long as 7 days without dropping the bottoms.

However, at this plant where comparatively high-temperature iron is being melted in conjunction with the hot blast equipment, it is the practice to drop bottoms at the end of each day's run. By doing this, it is possible to rebrick and have the cupola ready for operation in only 2 hours. Incidentally, the material left in the cupola after a day's run is comparatively clean and easily disposed of, primarily as a result of the use of water jackets. Volume of hot blast air, averages 5800 cubic feet per minute at 400 degrees Fahr.

Iron is tapped at 2750-2800 degrees Fahr. into a common spout serving both cupolas and leading to a 4-ton heavily insulated forehearth ladle which can be tipped manually. This ladle has about 8 inches of firebrick in sidewalls and is partially covered on top. Iron is desulphurized in this ladle, about 5 pounds of purite being added for each ton of iron tapped for the purpose of holding sulphur content to a maximum of 0.10 per cent .

From the forehearth ladle, molten iron is poured into a 2000-pound transfer ladle which carries the metal about 25 feet to an electric furnace with 2-ton cold melt rating, but accommodating about 4 tons of molten charge. That duplexing unit has three 6-inch electrodes and is the standard type of electric furnace supplied by the Pittsburgh Lectromelt Furnace Corp., Pittsburgh. Iron is charged and tapped practically continuously in the unit, being tapped from the opposite side of charging. Temperature is brought up to the range 2850-2900 degrees Fahr. with ½-hour laboratory checks being made on analysis to hold carbon within the range 3.55-3.65 per cent, silicon within 2.12-2.24 per cent, manganese 0.85 (*Please turn to page* 100)

Fig. 7 (Upper left)—Iron is melted in 54-inch hot blast cupolas, water jacketed at the melting zone. A water jacket comprises seven steel coolers, each with separate intake and discharge water lines as shown. Fig. 8 (Upper right)—Tapping iron from 4-ton desulphurizing forehearth ladle into 2000-pound transfer ladle. Fig. 9 (Lower left)—Here the runner box is tipped to spill the iron into the rapidly rotating drum. Fig. 10 (Lower right)—Hoppers shown in Fig 6 discharge at this central station where measured amounts of borings, pig iron and return scrap are fed into the charging bucket on the car in the foreground



AMONG DETROIT FOUNDRIES

By A. H. ALLEN
Detroit Editor, The Foundry

BREATHING spell from the routine of business was a welcome relief to large numbers of Detroit and Michigan foundrymen who journeyed to Cincinnati for a few days of relaxation and contact with confreres last month. Most of those who went were either in the position of having so little business currently that their departure made no difference, or of being so burdened with rush work that a change of venue was almost a necessity.

Die foundries are seasonally busy with new model programs coming into full bloom. In many cases the initial dies have already been supplied and orders for duplicates are being released; in others, the first dies for 1940 models are still in the active stage. Melters in lines other than automotive still find business comparatively slack.

Will Show Early 1940 Models

It appears likely Buick and Packard will be the first to have 1940 models on display. Photographs of the new Buick were taken early in May, and production jobs probably will be coming off the line at Flint about the middle of July. The large Buick foundry at this writing (May 19) has not yet closed down for changeover to new parts, but inasmuch as this unit supplies castings to other General Motors divisions, it will likely be among the first to switch over to 1940 runs. Few changes are in prospect for castings, since mechanical changes are being overshadowed by sheet metal revisions.

Packard likely will be closed the better part of June for changeover to new models. The 1940 versions are reported to embody narrower radiator shells and other external embellishments, with the possibility of standard and deluxe eight-cylinder models supplanting the present 120 and super-eight models.

With completion of a materials bridge across Grand boulevard, connecting two main divisions of the plant, materials now can be moved to any section of the plant by conveyor, with the exception of the forge shop and the foundry. Comment still is heard concerning the possibility of a new foundry at Packard, but nothing positive has emanated from the management. Recently the company is understood to have taken out a license to build a new type of airplane motor, embodying split-sleeve valves and ideally suited to high-speed operation. Should sufficient orders materialize for this power plant, and there are good reasons to believe some substantial government business is in prospect, expansion of foundry facilities may be dictated.

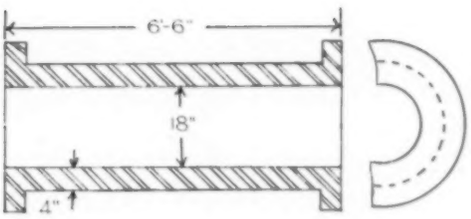
Castings will figure prominently in the new low-price tractor shortly to be introduced by Ford. A new 4-cylinder engine, with 3¾-inch bore has been developed to power the unit which has a number of remarkable operating features. Implements are mounted directly on the tractor itself, instead of being towed, and by gearing and davits are arranged so that a constant depth of bite in the soil is maintained regardless of the contour of the ground or tilt of the tractor. Further, if the implement should strike an obstruction, instead of the front wheels lifting off the ground with resultant danger of tipping the entire tractor, the rear wheels lift and spin until the power is reduced, the tractor backed up and the implement raised mechanically to clear the obstruction.

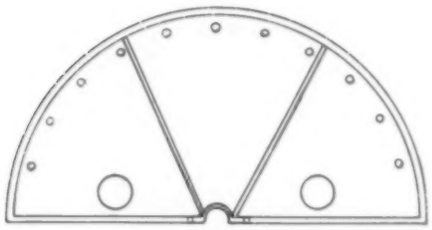
Adapted from Irish Design

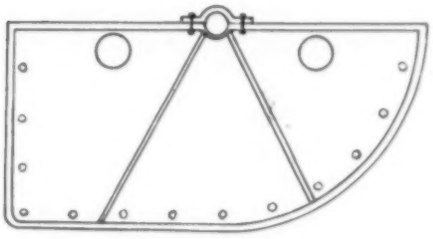
Weighing a reported 1400 pounds, the new tractor is said to show far better economy than the unit with which Ford was experimenting in Georgia last year at this time. It has been adapted from a design perfected by the Harry Ferguson organization in Belfast, Ireland, where the units are known as the H-F tractors and sell for about $1400 with three implements. Price of the Ford tractor is understood to be about half this figure, although one business man in this district has placed an order for one of the units and was told the price would be in the neighborhood of $400, without implements.

Unusual feature of the (*Please turn to page* 106)

Mold Stern Tube In Roll Flask







FOLLOWING the grounding of a tanker, an order was received for the steel stern tube shown in Fig. 1, 18 inches inside diameter, 4 inches thickness of metal and 6 feet 6 inches in length. No pattern was available. The chief engineer on the ship supplied a sketch with the necessary dimensions and a request for the casting as soon as possible.

Survey of the foundry facilities indicated that the casing equipment in which various size sand cast rolls were molded might be employed to advantage in this instance. Briefly, the method may be described as the application of a sweep to form the desired contour of the casting in a body of sand packed in metal casings open at each end. Two or more of these casings may be joined end to end to make a mold of any desired length. One half the casing is semicircular in cross section and the other is rectangular at one side to provide space for the long sprue extending from the pouring head to a bottom inlet gate. The variation in shape is shown in Fig. 2 which also shows the ribbed plates used at the ends of the casings while sweeping the molds in a horizontal position. A journal bearing in each end plate supports the spindle. A light bearing cap, forged or cast, prevents the spindle from jumping.

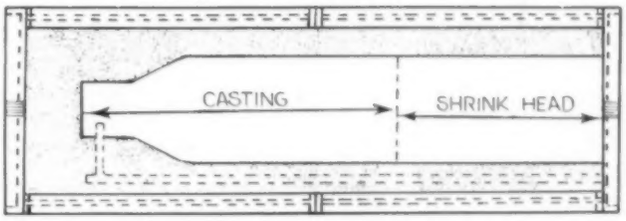


Fig. 3 shows half a roll mold with the spindle and sweep removed. The shrink head extension, usually about 45 per cent of the whole, is provided to prevent segregation and piping in a heavy casting of this kind cast in a vertical position. In instances where two small rolls are made by the same method in a single flask as shown at Fig. 4, the sprue is placed between the two castings with the gates at the lower end set at a tangent in the usual manner. In instances of this kind of course the special (*Please turn to page* 109)

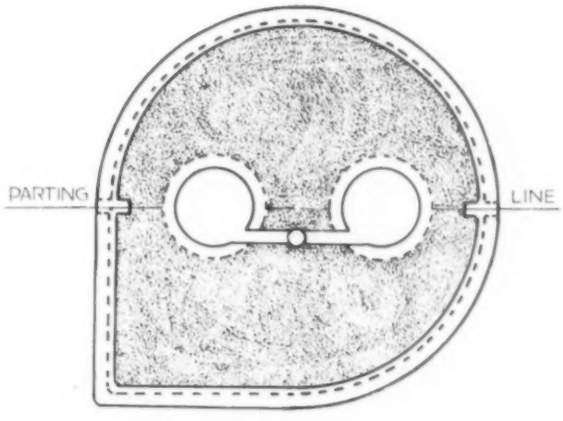
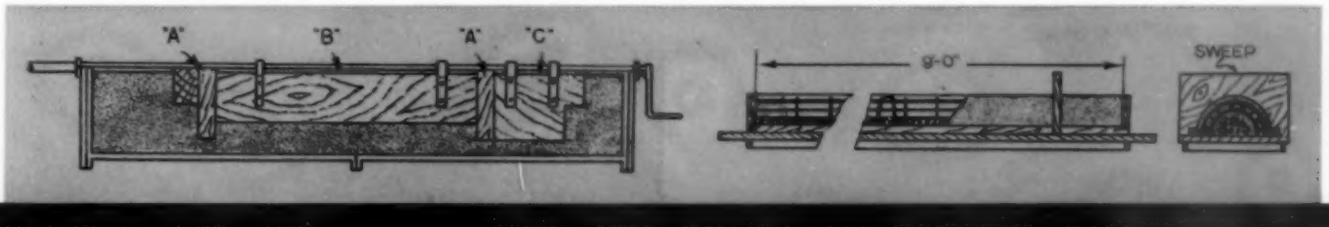


Fig. 1 (Top)—Steel stern tube casting. Fig. 2 (Center top)—Plate castings used to plug lower end of roll molds. Detachable journal caps prevent spindle jumping. Large holes accommodate crane hooks. Fig. 3 (Center bottom)—Plan view of finished drag roll mold showing tangential gate. Above: Spindle and sweep just removed from mold. Fig. 4 (Right)—End view of mold accommodating twin castings of small size produced by same method. Fig. 5 (Below left)—Half mold for stern tube swept to shape. AA—loose flange patterns, B—body sweep, C—riser sweep. Fig. 6 (Below right)—Half core for casting partially swept up



Production P

In Steel C

CASTING molten metal into the approximate shape desired for a definite purpose always has presented many obvious advantages over the more tedious procedure of whittling, cutting or hammering the shapes from a solid block of metal. Accomplishments of the foundryman therefore have played an important part in our industrial development. Over the past century these accomplishments have made possible many of the mechanical devices of today. Tradition built up by the excellent workmanship of former foundrymen also paved the way to the day when practically any castable metal can be transformed into a usable casting.

Prior to the development of the bessemer, the open hearth and the electric furnace processes for cheap, large scale production of steel, most of the developments in the manufacture of castings were confined to gray iron, malleable iron, and nonferrous metals and alloys. The industrial use of steel castings is largely a present century development. In many applications no new product is involved. Steel has been substituted only for cast iron or nonferrous compositions, to meet high stresses imposed by modern machinery design.

In spite of the fact, well known to metallurgists, that the solidification characteristics of steel are entirely different from those of cast iron and the nonferrous compositions, the changes made in substituting cast steel for the weaker materials often have been confined to modification of the pattern to allow for the difference in shrinkage during cooling and solidification. Without a careful analysis of the fundamental differences in the problems involved in such a substitution, this is a perfectly natural practice. Through traditions of the foundry industry some of the limitations inherent in the older types of metals have become more or less accepted as standard in the minds of designers who, by force of habit, are disposed to accept certain well established principles as applicable to all cast metals.

Comparing the foundryman's problems in the production of cast steel with those connected with gray cast iron—the most common ferrous casting metal—the following points represent the most outstanding differences:

A. Melting and freezing points of casting steel are

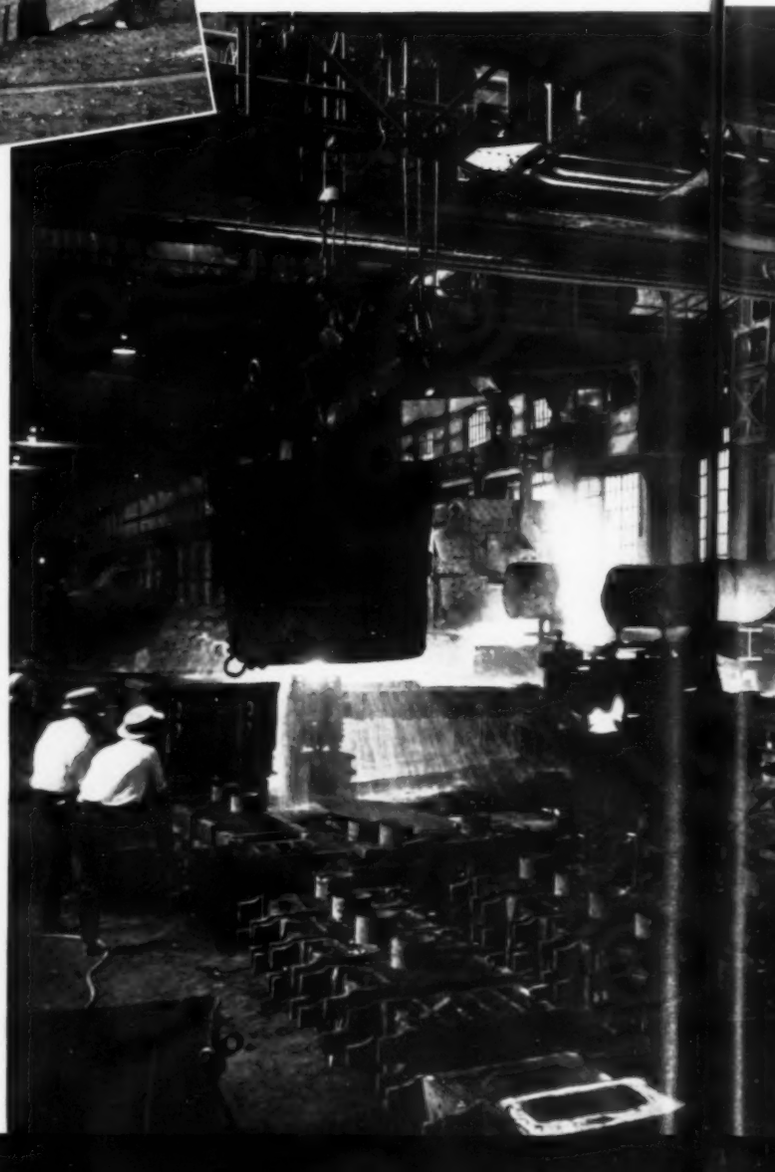


Fig. 1 (Above)—The casting was molded in the opposite position to that shown. Fig. 2 (Right)—Long basins may be required where two or more cranes and ladles are engaged in pouring steel into a large mold

considerably higher than for gray iron. For successful casting, a temperature from 400 to 500 degrees Fahr. higher is required. These higher temperatures call for different molding materials than those found satisfactory for cast iron. Men familiar with the early days of steel casting will recall how the steel foundry was known as the *lava bed*. Refractories used and the high temperatures encountered were looked upon by the iron foundrymen as something almost uncanny.

B. Linear contraction of cast steel, about twice that of the average cast iron, induces greater hazards through the formation of hot tears in large dimension steel castings. This necessitates consideration of collapsible molds and cores to permit free contraction of castings during solidification and cooling.

C. Contraction in volume during solidification and cooling is somewhat over twice as great for cast steel as for the average gray iron casting. This makes it necessary to provide reservoirs of molten steel in proportions larger than in connection with gray iron to feed the castings during solidification. In many designs the weight of risers, heads and gates, serving only as feeding reservoirs and forming no part of the finished casting, may exceed the weight of casting. In some cases they may weigh twice as much as the casting proper.

D. Molten steel is more viscous than cast iron. In connection with the high freezing point this tends to promote rapid solidification in thin sections. The high degree of over-heat consequently required for light section castings has a marked physical and chemical effect on the mold refractories.

n Problems

l Castings

By P. E. MCKINNEY
Metallurgical Engineer, Bethlehem Steel Co.

Consider Certain Fundamental Conditions

Considering the foundryman's problems in making steel castings it may be well to discuss in more detail the fundamental conditions involved in the solidification of steel. The ideal condition for solidifying steel is presented by an ingot mold designed for a uniform cooling rate and equipped with a refractory hot top to provide the necessary feeding of liquid metal to the solidifying mass.

In all wrought steel products the greatest attention is paid to the ingot design, to obtain symmetrical solidification ratio by providing ideal proportions between the cross sectional area and the contact surface of the mold, by corrugations or otherwise.

Steel used in sand castings invariably is deoxidized by liberal additions of silicon and, in many cases, of aluminum. That practice is necessary to prevent formation of blow holes and gas cavities during the comparatively slow solidification of this type of casting. The resulting increase in liquid shrinkage results in a greater number of shrinkage cavities than normally would be anticipated with chilled cast steel used in the production of wrought steel products.

Comparing the plain design of an ingot with the simplest design usually involved in steel castings it is easy to visualize many conditions where solidification departs from the ideal procedure. This is not an argument for making all steel castings in the simple form of an ingot. It is only pointed out to draw attention to differences which not always are recognized when steel castings are compared with

other steel products. Steel castings, to serve their purpose, must be produced in various intricate shapes, not only to save prohibitive machining operations, but also, in most cases, to provide shapes with streamlines, symmetry and similar qualities practically impossible to produce at any cost by machining. In the development of many such shapes the broadest departure must be made from the ideal conditions for solidification as encountered in an ingot.

Equalize Rate of Solidification

After getting from the designers all possible concessions to provide uniformity of cross section, elimination of re-entrant angles and other features which will insure the most desirable foundry conditions, the steel foundryman, confronted with the task of producing intricate shapes, still must resort to various ingenious methods for equalizing the rate of solidification. He must use chills, special heading, and similar devices.

Excellent articles on design, directional solidification, hot tears, solidification of steel castings, and related topics by several authors, Bull, Batty, Wheeler, Briggs and Gezelius, and others have been presented in the pages of THE FOUNDRY. These will not be discussed in detail. However, the fact should not be lost sight of that a foundryman cannot wave a magic wand and reverse the laws of nature in regard to the solidification of steel.

In many cases steel foundrymen more so than engineers interested in other forms of metal fabrication probably have been delinquent in failing to point out some of the fundamental obstacles to good production of castings to certain designs. Many of the criticisms aimed at castings, in comparison with weldings, have failed to take into account that the welding usually is made with a great deal of consideration to the limitations of the art of welding. The competing shape, in the form of a casting, is produced to represent the ideal of the designer, and without the same degree of consideration to the fundamental limitations attributable to the characteristics of the material used, but which otherwise are beyond the control of the foundryman.

In many instances customers have imposed specifications which drastically limit welding or even internal chills without due regard to the necessity of using such means to produce the most satisfactory finished product. Through the constructive efforts of many investigators during the past few years, these arbitrary prohibitions are becoming less drastic, at least among the more far sighted users of steel castings.

Emphasis Placed on Physical Properties

During the past 10 years much time and attention has been given to writing steel castings specifications in which the primary consideration was the chemical composition and the physical properties of the materials. In many cases purchasers have thought only in terms of physical properties with little regard to the question of soundness. Frequently this has been based on the belief that lack of soundness necessarily is due to some shortcoming on the part of the foundryman. To some extent this possibly may be attributed to the latter's reluctance to admit that he cannot produce successfully in de- (*Please turn to page* 110)

Fig. 3—Mold in course of construction for the casting shown in Fig. 1. Men engaged in this kind of work are molders of skill and experience

Many Nonferrous Alloys Available

By N. K. B. PATCH

COMPOSITION 1*HH* (THE FOUNDRY for May, page 94) is the same as composition 1*GG*, excepting that it does not permit the presence of nickel or zinc and calls for 0.7 per cent phosphorus. It will be seen from the chemical requirements in Table V in the May issue that it is not to be made from scrap but must be made from new metals so that no zinc can creep in and no nickel will be present. Requirements for 0.7 per cent phosphorus indicate that it is a phosphorus bronze deoxidized with an ample amount of phosphorus. In fact, such an amount of phosphorus actually should form an additional compound, a hardening element of copper phosphide, tin phosphide or both, which tends to increase the hardness of the alloy and to some extent its tendency toward brittleness.

Used for Variety of Bearings

It is essentially a bearing composition of high order and is specified regularly under A.S.T.M. specification B30-36 (17) and S.A.E. specification No. 64. The composition is somewhat plastic or comformable so that it cannot be used in bearings under extreme loads, but it is used regularly for a wide variety of bearings in locomotives and trains and machinery of all types where moderate pressures are the rule. Both these compositions machine readily, cast readily and have been found to give fine service for a wide variety of machinery parts.

The castings are usually sound, and if the composition is melted properly so that gassing has not occurred, the castings are free from blow holes or defects that are so common to some other compositions which compete with that type in the bearing field.

Composition 1*II* is essentially a variation of composition 1*CC*. The remarks relative to 1*CC* apply to composition 1*II* with the exception that in the case of the latter 0.75 per cent nickel is present to provide a hardening and densifying effect. By comparison of the physical properties listed in Table VI it will be seen that these alloys are much alike in their physical characteristics and, therefore, can be used more or less interchangeably in industrial service.

Compositions 1*JJ* to 1*OO* might be termed a series of typical leaded copper tin bronzes or high lead bronzes, as they frequently are designated in the trade. Almost all of this group or series are likely to contain some nickel as commercially produced since manufacturers find that the density is better where a small percentage of nickel is present. Since nickel tends to increase the melting point of the matrix, it means that the solidifying point when cooling from the liquid to the solid is higher. Consequently the matrix sets quicker, thereby entrapping the lead before it has time to settle to the bottom of the mold in any marked concentration.

One of the problems that some foundrymen have in the production of high lead alloys is the concentration of the lead at the bottom side of the casting when taken in the position in which it was cast. There are many methods in vogue for the proper suspension of the lead, many of them using the previously mentioned idea of a fractional (*Please turn to page* 104)

QUESTIONS AND ANSWERS

Coke Reclaimed From Cupola Drop Has Doubtful Value

We are wondering if we have the facts on the value of coke retrieved from the cupola drop. On 20 heats the average coke charge was 3660 pounds and the average retrieved was 870 pounds. Bed coke in the cupola old and new is 1575 pounds. Old coke bulk for bulk weighs 10 per cent more than new coke probably because of slag inclusions and moisture. What has been the experience of other foundrymen? Is it common practice to spread the drop coke throughout the heat, or to use the greater part in some particular place?

Practice of recovering coke from the cupola drop is fairly universal even though in certain cases the amount recovered is not worth the trouble. For example in a cupola running on short heats the slag is not drawn off but remains in the well of the cupola. When the bottom is dropped, slag and coke are mixed to such an extent that the labor of separating them is not compensated by the amount of coke recovered. In your case with a total coke charge of 3660 pounds, a bed charge of 1575 pounds and a recovery of 870 pounds from the drop we assume that you are melting about 10 tons per day, running the cupola an hour or an hour and a half and slagging in the usual manner.

Consider the following figures: Good foundry coke—88 to 90 per cent carbon—produces approximately 13,000 B.t.u. per pound. Approximately half of this heating value is extracted from the coke before it appears in the drop, therefore the remaining heating value amounts to only 6500 B.t.u. This half burned coke alone would not melt iron satisfactorily, but it increases the bulk and reduces the cost by a small amount when added to good coke in small amounts.

On a cost basis consider these figures: Assuming that coke costs $10 a ton, then 870 pounds represents $4.35. However, since the recovered coke has lost approximately half its thermal value, this figure is reduced to $2.18. Deduct from this at least 25 cents for the labor of picking it over and the recovered coke represents a value of $1.93. Not much per day, but a rather sizable item over a year's operation. In many places the recovered coke is used for firing the core oven, or in salamanders used for heating the shop in winter.

One feature that strikes us as extraordinary is your recovery of 870 pounds of coke in the drop of a cupola where the original bed is 1575 pounds. This would seem to indicate that the bottom is dropped before the last iron is melted. Referring to the last question in your inquiry, the general practice is to add a small amount to each charge and thus distribute it as widely as possible throughout the entire heat.

Production of Nickel Castings Requires Close Attention

We are attempting to make pure nickel castings, and will appreciate any information you can give us. If possible advise proper flux, and the way to slag that metal.

Production of nickel castings requires careful attention to molding practice, proper melting equipment, and a definite deoxidizing and desulphurizing treatment. Shrinkage is roughly twice that of cast iron or $\frac{1}{4}$-inch per foot. That high shrinkage in conjunction with tenderness slightly below the solidus requires special attention to insure adequate feeding of the casting and special precautions in molding to avoid shrinkage cavities and pulls. High pouring temperature necessitates use of a refractory sand which does not cut or wash away.

Some silicon should be present to increase fluidity and reduce the tendency of the metal to cut. It also aids in deoxidizing the metal, and increases the physical properties. Amount of silicon ranges from 0.75 to 2.0 per cent. The lower amount is for castings of thin section while the higher is employed in heavy castings. Nickel is poured at 2800 degrees Fahr. for heavy castings, and at 2900 degrees Fahr. for light castings. Consequently it must be melted in furnaces suitable for obtaining high temperatures.

Nickel for castings is supplied in small ingots or in shot form. Ingot metal does not contain silicon while the shot contains about 1 per cent. If ingot metal is used, the metal is melted and 5 min-

utes before it is ready to be poured, 1½ pounds of metallic silicon is added per 100 pounds for the majority of castings. With shot nickel only ½-pound of metallic silicon is added. The silicon is stirred in well with a wooden pole. Just before pouring 1½ ounces of metallic magnesium per 100 pounds of nickel is added as a deoxidizer and desulphurizer. Stick magnesium should be used, and it must be introduced below the surface with a pair of tongs or a holder. It is stirred around for a few seconds to insure thorough diffusion. Then the metal should be poured as quickly as possible.

Water Front Stove Castings Leak Around Chaplets

Under test some of our water front castings for cook stoves leak around the chaplets on the cope side. Pattern equipment and cores are perfect. The castings are poured with hot iron and we cannot understand why some of the chaplets knit properly while others do not.

If you had forwarded a small piece of the casting containing a chaplet we should be in a better position to offer an opinion on the cause of the defect. Under the conditions outlined hot iron and perfect cores, we can suggest only one factor that may be responsible. That is that the chaplets are slightly rusty or slightly damp. Presumably they are tinned or copper plated. If not, that may be the cause. For thin castings it is advisable to increase the thickness of metal in the vicinity of the chaplets.

Small bosses are provided in the core for this purpose. If the metal in the vicinity of the chaplet is porous, the casting must be scrapped. However, if the leak is trifling, due to lack of close cohesion between metal and chaplet, it may be remedied by peening the top of the chaplet and the metal in the immediate vicinity. In other instances the casting may be salvaged by drilling out the chaplet and inserting a plug.

Consumption of Facing Sand Varies to Some Extent

A recent statement that the average amount of new sand used in the gray iron foundry per ton of castings is in the proportion of 1 ton of sand per 10 tons of castings seems to indicate a very rough estimate. Our records over a period of several years show that we use 1 ton of sand for the production of 4 tons of castings, or 1 ton for 5 tons of metal melted.

Answers to a study made by THE FOUNDRY in connection with a rather extensive survey of the sand situation several years ago, indicated that gray iron foundries used new sand from 1 to 3, to 1 to 15 in proportion to the weight of castings produced. Naturally the light work foundries used the least and the heavy green sand, dry sand and loam shops used the most. Some shops use a certain amount of clay or other bonding agent instead of new sand, while others use no facing sand on many castings. Assuming that you use facing sand on all your castings, the amount of 1 to 4 represents approximately standard practice. For example consider a typical casting, a square plate 4 x 4 feet and 1-inch thick. Area of this plate is 2304 inches and weight is 600 pounds. To cover this plate with facing sand 1-inch thick on both sides will require 4608 cubic inches of sand, that is 2.60 cubic feet. Deducting 10 per cent for coal dust we have 2.34 cubic feet.

Of this the usual amount of new sand is one half, or say 1.17 cubic feet. In other words 117 pounds, since the approximate weight of sand is 100 pounds per cubic foot. One hundred and seventeen pounds of new sand to 600 pounds of casting represents a ratio of 1 to 5. Obviously if you face all your castings with the mixture indicated, one part new sand to one part old sand, the ratio of new sand to casting weight will work out at about 1 to 5. However, in many cases the amount of new sand in the facing may be reduced to 25 or 30 per cent, or omitted altogether and as a result the ratio of new sand to casting weight will show a wider spread.

Brass Rings in Aluminum Alloy Casting Cause Some Trouble

We are sending a section of an aluminum casting 15½ inches in diameter and 1½-inch thick. Three brass rings 6 inches in diameter and ⅜-inch thick are cast in the aluminum, and form a trefoil in the center. About ⅜-inch space is allowed between the closest points of tangency of the rings. The aluminum alloy used is the 13 per cent silicon, modified type. We are encountering a bad defect on the drag side. We had no trouble with the same casting which previously was made without the brass rings.

Examination indicates that the metal did not lie quietly in the mold. Part of the difficulty we believe is due to the molten aluminum blowing from the brass rings. Boiling action is quite pronounced near one of the rings, but only just noticeable on the others. The trouble evidently arises from the fact that the ring may not be perfectly clean at the particular point where the blowing occurred, or possibly the ring may have been wet due to moisture condensation or some other factor.

The rings must be absolutely clean, preferably should be placed in the mold while warm and the casting poured immediately. While the ring caused some of the agitation, we do not believe that it is responsible for all of it since the surface is badly cut; much more than any evolution of gas from the ring would generate. Therefore, it appears as though the mold contained a wet spot due perhaps to trying to patch the surface, or it may have been rammed too hard in that particular spot.

We are inclined to think that the trouble arises from patching since the cope side shows a patched area about 3 x 2 inches, oval in shape, where some sand evidently dropped out and the molder slicked the surface without attempting to replace the small quantity of sand which dropped or stuck to the pattern. The same thing may have occurred on the drag side, but the molder got it a little too wet when he went to patch the surface.

Stress Relief May Stop Cracking

Please give us information on stress relieving gray iron castings? The casting in question is a fire door weighing approximately 600 pounds with a metal thickness of 1-inch. We have been having trouble with the doors cracking in service, and believe that stress relieving will help.

While it is possible that stress relieving may stop the cracking to some extent, we believe that your primary difficulty is due to a composition which does not possess heat resistant qualities. Since we do not know what your present analysis is, we cannot make any suggestions on any changes. However, stress relieving can be accomplished by heating slowly to about 1000 degrees Fahr., and holding for one hour until all parts of the casting reach that temperature. Then cool slowly in the furnace.

Local Disturbance Causes a Defect

We are forwarding a small hydraulic brake casting on which the loss is approximately 30 per cent, due to a small defect in the bore. Cupola charge is made up of 50 per cent pig iron, 10 per cent steel and the remainder return sprue. As tapped, this iron analyzes: Silicon, 2.35 per cent; sulphur, 0.08 per cent; phosphorus, 0.19 per cent; manganese, 0.70 per cent, and total carbon, 3.45 per cent. Drillings from the casting submitted show: Silicon, 2.29 per cent; phosphorus, 0.158 per cent, and total carbon in the defective area 3.84 per cent. The castings are annealed for 1 hour at 1200 degrees Fahr. We shall appreciate your opinion on the probable cause of the defect, also the cause of the high carbon in one place.

Assuming that the iron at the spout showing a carbon content of 3.45 per cent, was the same iron poured into a casting which showed a carbon content of 3.84 per cent and assuming further that the analysis was accurate in both instances, we know of no plausible theory to account for the discrepancy. A jump of 30 points is rather extraordinary. However, in this particular instance the analysis of the iron is not a factor of major importance and is not responsible in any manner for the defect in the bore of the cylinder.

This defect is caused by a slight local disturbance in the metal while it is filling the mold. Something causes the metal to *boil* with the resulting formation of small bubbles. The bubbles burst but the thin skins float either to the top of the mold, or to some point where they come into contact with the wall of the mold and core and stay there to be enveloped by the remainder of the liquid iron. Their presence is disclosed when the casting is machined. The disturbance may be caused by hard or damp sand in the pocket on the bottom between the lugs, by a hard or ill vented main core, or by the small cores in the oil holes. A check on each of these features and application of the proper remedy will cure the trouble.

Average Sand Ratio About 1 to 10

Have you figures on the ratio between sand used in an iron foundry and the amount of iron melted or the total amount of good castings? Our castings range between 5 and 5000 pounds, with the greater number between 250 and 300 pounds.

Amount of new sand used in a foundry depends on many factors including cost of the sand. Where the sand is cheap and plentiful, the natural tendency is to use more than where the cost is comparatively high. In an extensive survey conducted by THE FOUNDRY several years ago the replies showed a wide variation in the amount of new sand used compared to the volume of castings. The general average was 10 per cent. That is over a yearly period 1 ton of new sand was consumed per 10 tons of castings produced.

Shrinkage Shows at Root of Teeth

We are enclosing blueprint of a gear blank 17 inches outside diameter, $4\frac{1}{2}$-inch face with six flat arms connecting the shallow hub with the rim. Metal enters the mold through a central sprue and three gates in the hub opening. The castings are gray iron with 30 per cent steel in the mixture and 1.00 per cent nickel. Molds are dry sand. After the teeth are cut we find one or two gas holes at the bottom of the teeth.

All the indications point to shrinkage and not gas as the cause of the holes at the root of the teeth. Due to the uneveness in section the casting does not shrink uniformly. The heavy section of rim in the vicinity of each arm is the last to solidify and since there is no available liquid metal in the neighborhood to compensate for this late shrinkage, a cavity is formed. Either of two remedial methods may be applied. In extreme cases it may be necessary to use both. In the first a large riser is placed on the rim in the vicinity of each arm. In the other, light chills are placed against the face of the wheel, or on the inside of the rim around the arms.

Has Trouble With Gas in Metal

What can we use to degasify red metal, bronze, and aluminum? Is there a chemical product on the market which will reduce the percentage of iron and aluminum in bronze and brass?

At the present time there are a number of proprietary materials on the market which are being employed satisfactorily for the degasification of all types of nonferrous metals, and alloys. The materials of course are of different compositions, depending upon the application, and are sold under various trade names. Consult the advertising pages of THE FOUNDRY for manufacturers' names.

In connection with your problem of gassy metal, your attention is directed to the importance of proper melting conditions. While there is a possibility that your gas troubles may arise from a highly oxidizing atmosphere during melting, we believe that the trouble mainly is due to melting under reducing conditions. Consequently it is suggested that you make the necessary changes to secure a slightly oxidizing atmosphere during melting.

Metals which have absorbed reducing gases show no change after the addition of the usual deoxidizing agents such as phosphor copper and phosphor tin. To eliminate such gases, it is necessary to add an oxidizing agent such as lead oxide. Also, do not heat the nonferrous metals to temperatures much over 100 degrees above the pouring temperature since the higher the temperature, the more gas will be absorbed. Also, do not permit the metal to remain in the furnace any longer than is necessary.

Refining operations such as you contemplate, that is the removal of iron and aluminum, hardly are such as to be conducted in the ordinary foundry. Such operations call for considerable skill and experience, and operations on a large scale to make it worth while. Our suggestion is to sell your contaminated material to a secondary smelter, which has the equipment for doing the work properly. Both iron and aluminum oxidize easily and that usually is the process employed for eliminating them from brasses and bronzes. In other words, the contaminated alloys are heated to high temperatures in highly oxidizing atmospheres. Continuous rabbling keeps the metal agitated so that the iron and aluminum compounds are brought to the surface where they are oxidized and form slag which later is removed. Oxidizing material, such as barium sulphate, etc., often is added to hasten the process, to form larger volumes of more fluid slag.

Molds Are Dried in Number of Ways

We are considering making some molds for monel flange castings of dry sand. Can these molds be dried satisfactorily with a coke or charcoal fire, or should we dry the molds in an oven.

If the molds are made in wood flasks you have no option but to dry them outside the oven. If they are made in metal flasks, you may dry them in the oven, or by one of several methods on the outside. The method adopted will depend to a considerable extent on local conditions.

For small molds, a good skin drying is sufficient, which means that the face of the mold is dried to a depth of approximately 1-inch. The mold is coated with a solution of plumbago or silica flour and molasses water and then exposed to the heat of a wood, coke or charcoal fire. If the equipment is available a gas or oil torch may be employed for the same purpose.

Cast Brass Spout Contains Holes

We are sending a cast brass spout which has been rejected after being partly polished, due to the numerous small holes in both polished and unpolished portions. We have tried changing the air-gas ratio in our tilting crucible furnace, fluxes, sands, mold hardness, runners, parting, gates, etc., without satisfactory results. One batch of castings will be fine and the next terrible.

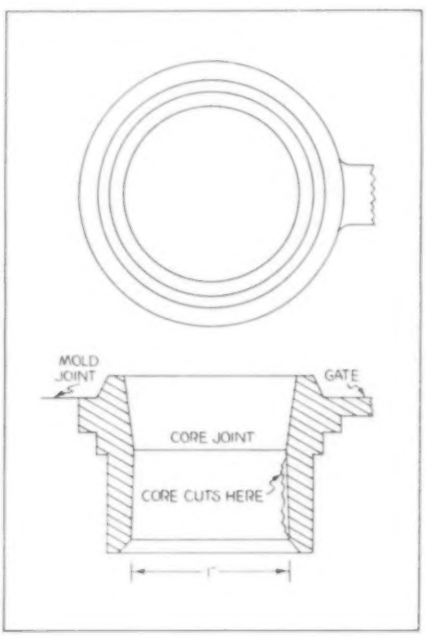
Careful examination of the brass spout under a magnifying glass reveals the presence of sand grains, and slag particles in the small holes which are indicative of careless molding and skimming. Consequently, the first suggestion would be to conduct a close investigation of those operations, and see that the work is performed as carefully as possible. Sand pits may be the result of not having a clean mold, too much crush, improper fit of core prints, cutting or washing of mold or cores, soft gates or sprues particularly at the pouring entrance etc.

The emission end of the spout shows a blow hole which may be from the core or from the mold. We are unable to state which it is due to the fact that several operations have been performed on the castings. However, you could ascertain which type of defect it is by examination of castings before cleaning. In general, a hole with a bright interior denotes core blows, while a discolored hole indicates action of steam. The interior of the spout near the same point shows penetration of metal into the core about 1/16-inch for a space approximately 3/32-inch wide and $^{3}/_{8}$-inch long which indicates that either a defective core was placed in the mold, or the sand was cut by the metal stream.

Sand Cuts on Green Core Surfaces

We are experiencing considerable trouble with the sand cutting on the upright green sand core in a small malleable union as in the sample forwarded. Molds are made on a hand squeeze machine in a 12 x 16-inch flask, 16 patterns per gate, two sprues per mold. The patterns are faced with sand containing 1 per cent coal dust and showing the following characteristics: Moisture, 7.4 per cent; permeability, 10; green compression, 9.6 pounds; green shear, 1.9; and dry shear, 15 pounds. Heap sand shows: Moisture, 7 per cent; permeability, 17 to 18; green compression, 8 pounds; green shear, 2.1; dry shear, 14, and dry compression, 62.5 pounds. The patterns for cope and drag are mounted side by side and each part forms approximately half the green sand core. We tried raising the mold hardness, but found that the cores in the end patterns break away in drawing the pattern.

So far as the particular form of defect is concerned, the density of ramming—of course within reasonable limits—is not a factor of major importance. The main factor in this particular instance is to provide a sand that will not crumble when struck by a stream of molten iron. This means an increase in the bond strength and may be secured through the addition of practically any bonding agent to your present sand.



Sand cuts on core face opposite gate

The only sand to be treated is the relatively small amount for the green sand cores. The simplest method is to add new molding sand to the facing mixture. Several proprietary clay and cereal binders are available. If used to excess they will defeat their own object by reducing the general permeability to a point where the cores will scab instead of cut. Incidentally your present moisture content of 7 per cent is a trifle on the high side.

On the sample casting submitted we note a shift at the joint of the core. This may be caused by a mismatched pattern plate, or by a shift in the flask pins. The feature does not show, but a possibility exists that the upper part of the core bears too heavily on the lower part. The pressure may not be heavy enough to crush the core, but it may be heavy enough to loosen the general structure and thus render the sand more susceptible to the washing action of the falling metal. We suggest a close check up on every feature in addition to the state of the sand.

Facing Will Cure a Rough Surface

We are forwarding a small gray iron solid L casting satisfactory in every respect with the exception of an area around the center that is rough. We shall appreciate your opinion on the probable cause of this defect.

Basing a conclusion entirely on the surface appearance of the casting we are inclined to the opinion that your sand is just on the refractory border line. The ends of the casting where the metal cools first, are quite clean. In the center where the greatest heat is concentrated, the sand fuses slightly and produces the roughened surface. It is quite possible that you are pouring the metal at a much higher temperature than necessary.

Before trying any experiments with the sand, pour the metal at the lowest temperature at which it can be handled satisfactorily. Alternative method for the prevention of roughness includes the use of coal dust in the facing sand, and blacking on the face of the mold. In the event that coal dust already is incorporated in the facing sand, increase the amount to a maximum of 1 part coal dust to 8 parts sand. The blacking is shaken from a bag over the face of the mold before it is closed.

MEN of INDUSTRY

HENRY S. WASHBURN, elected president of the American Foundrymen's association at the annual convention in Cincinnati, is president of the Plainville Casting Co., Plainville, Conn. Mr. Washburn was born in Brooklyn, N. Y., received his early education at St. Paul's school, Garden City, N. Y., and later attended Yale university.

His first commercial position was as bookkeeper with the Corn Exchange bank of New York. From 1906 to 1917 he held various positions as clerk, credit man and office manager with the D. L. & W. R. R., H. B. Claflin Co., and Butler Bros. of New York. From 1917 to 1921 Mr. Washburn was purchasing agent, Turner & Seymour, Torrington, Conn. Since 1921 he has been president and treasurer of the Plainville Casting Co., Plainville, Conn.

Mr. Washburn has been greatly interested in foundry technical association work, is a member of the Connecticut Foundrymen's association, the American Foundrymen's association and the Gray Iron Founders' society. He has served both as director and vice president of the A.F.A. (See page 26.)

♦ ♦ ♦

LESTER N. SHANNON, elected vice president of the American Foundrymen's association at the annual convention in Cincinnati, is vice president, Stockham Pipe Fittings Co., Birmingham, Ala. Mr. Shannon is well acquainted with the work of the association, having served as a director and member of the executive committee. He was one of the organizers and first chairman of the Birmingham District chapter of the A.F.A. and has taken an active part in the work of that chapter. Born in Carbon Hill, Ala., Mr. Shannon received his early education in the public schools there and later attended Birmingham Southern college from which he was graduated with a bachelor of science degree. Following graduation, he immediately became associated with the Stockham company in whose service he has risen to his present position. (See page 26.)

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DR. HARRY A. SCHWARTZ, manager of research, National Malleable & Steel Castings Co., Cleveland, has been awarded the E. J. Fox gold medal by the Institute of British Foundrymen for outstanding services in the development of malleable castings. Dr. Schwartz is the third recipient and the first American to be so honored. The presentation of the medal will be made during the International Foundry congress in London in June. Dr. Schwartz was born in Kentucky in 1880 and received his education at Rose Polytechnic institute, Terre Haute, Ind. He was graduated from that school in 1901 and in 1903 and 1905 received his master's and professional degrees. In 1933 he received the honorary degree of doctor of science from that institution. Since his graduation he has worked for the National Malleable & Steel Castings Co. at Indianapolis from 1902 to 1920 and at Cleveland from 1920 to date. Mr. Schwartz is a member of several technical societies and has contributed many papers at their meetings. He also is the author of *American Malleable Cast Iron* and articles for THE FOUNDRY and other technical publications.

Dr. Harry A. Schwartz

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R. P. MORGAN, New England representative, Herman Pneumatic Machine Co., Pittsburgh, recently moved his office to 173 Albemarle street, Springfield, Mass.

♦ ♦ ♦

FRANK L. HAYES, formerly with Chicago Hardware Foundry Co., Chicago, has joined the sales force of Michigan Smelting & Refining Co., and will be located in the company's Chicago office.

♦ ♦ ♦

W. E. CRANER has been appointed representative in Houston, Tex. for Stearns Magnetic Mfg. Co., Milwaukee, and VERNON WHITING, Dallas, Tex. has been appointed sales representative of the company in the northern section of the state.

♦ ♦ ♦

WALLACE G. SMITH, formerly with the Baldwin Locomotive Works and Cramp Brass & Iron Foundries Co., has become sales representative of the Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.

♦ ♦ ♦

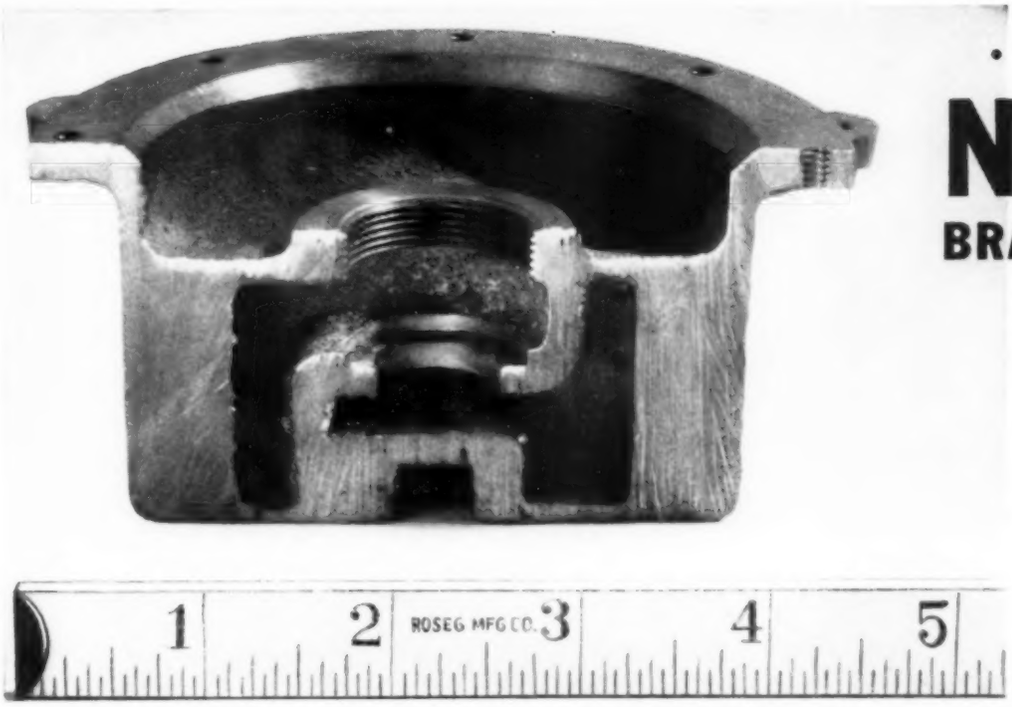
ED. F. WEINHEIMER, formerly connected with the by-product coke department, Great Lakes Steel Corp., Ecorse, Mich., has been appointed representative of the Ironton Fire Brick Co., Ironton, O., in Virginia, West Virginia, and Western Pennsylvania.

♦ ♦ ♦

GEORGE R. KINZIE, economist and business analyst, has been added to the staff of Battelle Memorial institute, Columbus, O., to aid in the consideration of economic factors related to the problems of industrial research. Mr. Kinzie formerly was associated with Standish, Racey & McKay, Inc., investment counsel of Boston. He will co-oper-

(*Continued on page* 46)

PRESSURE LEAKS *and* CASTING LOSSES PLUGGED



...*by using* NICKEL BRASS—BRONZE

Unusual variations in section thicknesses are mastered by adding 1½% Nickel to red brass compositions. Nickel increases fluidity, aids uniformity in thick and thin sections, minimizes porosity — thus plugging losses on rejects. This pressure-tight check valve — halved here for inspection — was cast by the National Bronze Co., Springfield, Mass., from 1½% Nickel brass.

Using an all-scrap base, the Universal Brass Mfg. Co., Los Angeles, cut foundry losses from shrinks and cracks 90% by adding 1% Nickel to sink fixture bronze. Nickel reduced porosity; and induced perfect forming of intricate patterns. Put Nickel to work for you!

To make water meter bodies stand 225 lbs. pressure, F. H. Koretke Brass and Mfg. Co., New Orleans, modifies their "G" bronze mixture with 1½% Nickel. Nickel reduces grain size, assures pressure-tight castings. Uniformity of dense-grained Nickel alloys assures easier machining, and saves on shop costs.

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.

(*Continued from page* 44)

ate with the various technical divisions of the institute. Mr. Kinzie is a graduate of the University of Florida and received a master's degree from Harvard Business school in 1935.

• • •

ERNEST F. HESS, metallurgical engineer, the Ohio Injector Co., Wadsworth, O., recently was elected chairman of the Northeastern Ohio chapter of the A. F. A. Mr. Hess was born in Toledo and attended the public schools there. He received his training as chemical engineer at the University of Michigan, Ann Arbor, Mich. Following graduation he became connected with the Toledo Edison Co., Toledo as chemist and then was made metallurgist for the Michigan Malleable Iron Co., Detroit. Later he became chief chemist for the Edward Ford Plate Glass Co., Rossford, O., and then joined the Libbey Glass Co. at the experimental bulb machine plant at Sandusky, O. He then entered the employ of the H. Koppers Co., Pittsburgh, as operating engineer of coke oven and by-product plants. After operating a commercial laboratory for a short time, he became associated with the Champion Spark Plug Co., Toledo, working in various capacities in the engineering department. In 1923 he joined the Ohio Injector Co., Wadsworth.

• • •

JOHN A. LEISK, general superintendent foundries and patternshops, Allis-Chalmers Mfg. Co., Milwaukee, recently completed 50 years continuous service with the company. The occasion brought congratulations from many sources. Employes of the foundries and pattern shops presented him with a suitably engraved wrist watch. One of the most widely known foundry executives in the Middle West, Mr. Leisk started his apprenticeship with the old E. P. Allis Co., in Milwaukee and had attained the position of foreman when the company erected the present extensive plant in the Milwaukee suburb, West Allis. He had an important part in the planning, layout and construction of the gray iron, brass and malleable iron foundries. Later he was appointed foundry superintendent and in 1934 was made general superintendent of the company's foundries and pattern shops.

• • •

FRED H. CLAUSEN, president, Van Brunt Mfg. Co., Horicon, Wis., presented the second annual board of awards lecture at the business meeting of the forty-third annual convention of the American Foundrymen's association, Cincinnati. He address the convention on "Business Management Has a Job." Mr. Clausen is vice president of the chamber of commerce of the United States, a past president of the Wisconsin Manufacturers' association and of the board of regents, University of Wisconsin. He is chairman of the board, Holeproof Hosiery Co., a director of Deere & Co., and vice president of the Farm Equipment institute.

• • •

WILLIAM J. MACNEILL, secretary, Federal Malleable Co., West Allis, Wis., recently has been elected president of the Wisconsin chapter of the A. F. A. Mr. MacNeill is a native of Wisconsin, and received his bachelor of arts degree at the University of Indiana after 2 years' military service during the World war. He then received his master of science degree in metallurgy at the University of Wisconsin in 1926. Mr. MacNeill is completing 20 years of service with the Federal Malleable organization, serving as secretary of the company at the present time. He was elected president of the foundrymen's group after serving one year each as director, secretary and vice president.

• • •

H. D. KNIGHT after 54 years connection with the Knight & Son Corp., Seneca Falls, N. Y., manufacturer of metal pattern letters, resigned his office of president and treasurer May 1 and retired from active work. Business will be carried on by members of the third generation of the family with Dr. Robert Knight, president; Robert W. Knight, vice president; Frank M. Knight, treasurer and Horace W. Knight, secretary.

H. D. Knight was born in Seneca Falls, N. Y., July 7, 1866 and was graduated from Mynderse Academy in 1884. His first position was that of telegraph operator at Hoosick Falls, N. Y., for the Troy & Boston railroad. In 1885 he joined his father H. W. Knight in the metal pattern letter business originally established in 1863. He became a partner 3 years later. Upon the death of his father in 1915 he conducted the business until 1931 when a corporation was established under the name of H. W. Knight & Son, Inc., with H. D. Knight, president. In addition to his business activities Mr. Knight over a period of more than half a century has been connected with many social, commercial, financial and educational movements in his native town. At various times he has served as village clerk, member of the school board, school director, trustee Auburn Theological seminary, trustee Seneca Falls Savings Bank, director Exchange National Bank, Seneca Falls Rotary club and Seneca Falls Country club.

• • •

EDWARD V. HEGG has been made manager of the New York office, Buffalo Foundry & Machine Co., Buffalo, manufacturers of chemical machinery, dryers and evaporators. Mr. Hegg has been with the Buffalo company more than 10 years, having served in various sales and engineering capacities.

• • •

J. ALFRED CURTIS, formerly control chemist with Basic Dolomite, Inc., Maple Grove, O., has joined the staff of Battelle Memorial in-

(*Continued on page* 48)

William J. MacNeill

John A. Leisk

Fred H. Clausen

Ernest F. Hess

A continuous production foundry where Osborn No. 333 type machines make drag moulds in coordination with Osborn No. 818 type machines making cope moulds.

Faster Production
OF HIGH QUALITY MOULDS AT LOW COST PER MOULD

● All the important advantages of the combined jolt and squeeze operation with the added advantages of power rollover and pattern draw are incorporated in the No. 333 type of Osborn Jolt Rollover Squeeze Pattern Draw Moulding Machine.

In foundries requiring fast, continuous and simultaneous production of both cope and drag moulds, No. 333 type Machines used in pairs with No. 818 type Osborn Jolt Squeeze Strippers are producing *more than a mould per minute.*

Your request for complete information about Osborn Jolt Rollover Pattern Draw Moulding Machines will receive our immediate attention.

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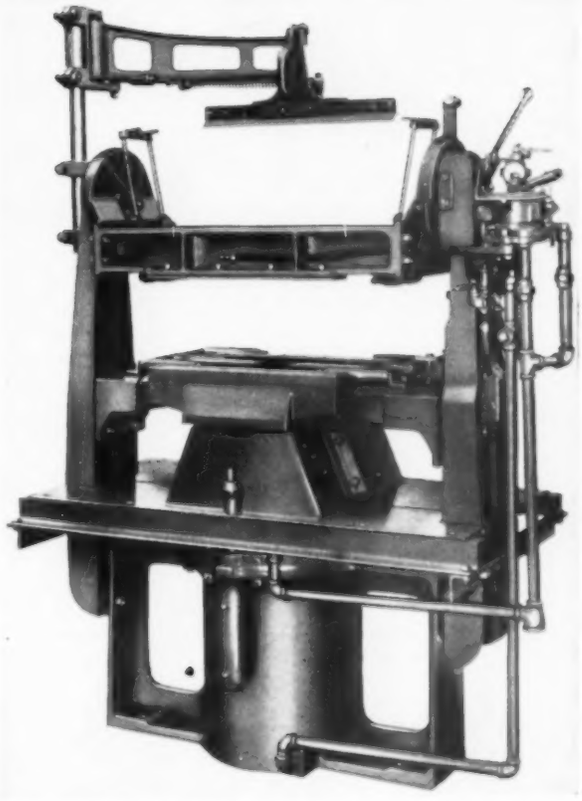

No. 333 Osborn Jolt Rollover Squeeze Pattern Draw Moulding Machine.

TIME PROVES VALUES

OSBORN

MOULDING MACHINES

(*Concluded from page* 46)

stitute, Columbus, O. Mr. Curtis, a graduate of Ohio State university, has been assigned to the analytical laboratory which, besides acting as a service department to other institute divisions, carries on research in methods of chemical analysis. He is a member of the American Chemical society.

♦ ♦ ♦

PROF. HARRY D. CHURCHILL, Case School of Applied Science, Cleveland, has been elected chairman of the Cleveland chapter, American Society for Metals. Other officers elected are: Vice chairman, LOUIS W. KEMPF, Aluminum Co. of America; treasurer, LEWIS F. HERRON, James H. Herron Co.; secretary, GEORGE J. HALES, Cleveland Electric Illuminating Co.

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JOHN E. DIXON, formerly vice president in charge of sales and engineering and director of the shovel and crane division of the Lima Locomotive Works, Lima, O., recently has been elected president of that organization. Mr. Dixon is a native of Milwaukee and a graduate of the University of Wisconsin.

♦ ♦ ♦

P. J. GARLENT, formerly assistant works manager of the Federal-Mogul Corp., Detroit, is now works manager, succeeding J. B. BRUSSELL who has joined Bendix Aviation Corp., South Bend, Ind. P. J. POTTER has been appointed foundry superintendent, succeeding FRANK J. COYLE, and C. M. HEATH, formerly associated with Battelle Memorial institute, Columbus, O., has succeeded Mr. Potter as metallurgist.

♦ ♦ ♦

WALTER GEIST recently was appointed vice president, Allis-Chalmers Mfg. Co., Milwaukee. Mr. Geist was born in Milwaukee and entered the employ of Allis-Chalmers in 1909, as an errand boy in the saw mill engineering department. From that position he advanced to draftsman and progressed through various positions and departments in the company from which he derived a broad knowledge and experience of its various products. In July, 1928 Mr. Geist was made assistant manager of the milling department as a result of his engineering work on power transmission. In July, 1933, he was appointed general representative of the company, in which capacity he supervised the personnel of all district offices of the company, both domestic and foreign.

♦ ♦ ♦

OLIVER E. MOUNT, secretary-treasurer, American Steel Foundries, Chicago, has been appointed chairman of the workmen's compensation, health and safety committee of the Illinois Manufacturers' association. Vice chairmen are J. L. Earlywine, Carnegie-Illinois Steel Corp.; H. G. HENSEL, Youngstown Sheet & Tube Co., and DR. V. S. CHENEY, Armour & Co.

♦ ♦ ♦

IRA F. CHENEY, superintendent, Detroit plant of Griffin Wheel Co., manufacturer of chilled iron car wheels, has been transferred to St. Paul as superintendent of the company's larger plant in that city. Long active in foundry circles in the Detroit area, Mr. Cheney for the past year has been chairman of the Detroit chapter of the American Foundrymen's association. He will be succeeded at the Detroit plant by P. H. Loveland.

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ELMER J. CARMODY recently became connected with Charles C. Kawin Co., Chicago, as foundry engineer. Mr. Carmody received his bachelor of science degree in mechanical engineering from Michigan State college and his master of science degree in mechanical and chemical engineering from the same institution. Previously he has been connected with the Saginaw Malleable Iron Co. division of General Motors Corp., Saginaw, Mich., the Oliver Farm Equipment Co., South Bend, Ind., Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., and the Superior Engine division of National Supply Co., Springfield, O.

♦ ♦ ♦

JOHN STORM, formerly a member of the sales staff at the Detroit branch warehouse and sales office, Carborundum Co. has been appointed district sales manager at New York with headquarters at the company's branch warehouse and sales offices, 601 West Twenty-sixth street.

♦ ♦ ♦

J. J. O'BRIEN, formerly president, South Bend Lathe Works, South Bend, Ind., has been elected chairman of the board. R. E. FRUSHOUR, formerly vice president has been named president. H. A. SMITH formerly secretary has been made vice president and treasurer, FRANK C. ERHART, formerly treasurer was made vice president in charge of sales and MAURICE HOWARD was named secretary.

Book Review

Dictionnaire International De Fonderie (International Foundry Dictionary) edited by L'Association Technique de Fonderie, Paris; cloth; 334 pages; 3½ x 5½ inches.

This international dictionary of foundry terms in preparation for several years and issued by the Foundry Technical association, 66 Rue Boissiere, Paris (XVIe) France gives the definition in the French language of about 800 words and technical terms used in the foundry. In addition it has alphabetical indices in French, German, English, Spanish, Italian, Polish, Portugese, and Czechoslovakian. Independent of the commission especially appointed for the work, a number of distinguished engineers and technicians, specialists in the foundry and instructors in foundry trade schools

(*Concluded on page* 50)

Walter Geist

Oliver E. Mount

Ira F. Cheney

Elmer J. Carmody

THE FEWER, THE BETTER

The demand of the times for more production per dollar, without sacrifice in quality, brings into sharper and sharper focus the necessity for the use of the most modern materials. It is natural that the more different steels specified in machine construction, the greater the fabrication and stock room complications.

To reduce these complications, many manufacturers are taking advantage of the versatility of Molybdenum Steels. One, a builder of a varied line of heavy duty machines, replaced four different alloy steels with Chromium-Molybdenum Steel (SAE 4140) for everything from heavy crank shafts to small screw machine parts.

Overhauling your own material specifications may disclose similar opportunities for highly profitable standardization on a versatile Molybdenum steel. To assist you we will gladly send our technical book "Molybdenum in Steel", free upon request.

PRODUCERS OF MOLYBDENUM BRIQUETTES, FERRO-MOLYBDENUM, AND CALCIUM MOLYBDATE

Climax Mo-lyb-den-um Company
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MOLY

(*Concluded from page 48*)
collaborated in the preparation of the work. In the present edition the French word is preceded by a registration number followed by the French definition. The registration number distinguishes the word in all languages and permits finding an approximate translation in one of the indices at the back of the book. French words are classified alphabetically and are preceded by their registration number in one section. In a second section the words are followed by the numerical index. The same method is used in the presentation of terms in the various foreign languages.

A. F. A. Elects Directors

ELECTION of five new members of the board of directors of the American Foundrymen's association for terms of 5 years was announced at the annual business meeting of the organization held at Cincinnati on May 17. The new directors are as follows: William B. Coleman, Chambers R. Culling, Otto A. Pfaff, Marshall Post and Fred J. Walls. Photographs of these men are reproduced on page 27 of this issue.

Marshall Post

MARSHALL POST is vice president and works manager, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa. Mr. Post previously has served as director and vice president and is the retiring A.F.A. president.

Born in San Antonio, Texas, Mr. Post has had an extended career in the foundry industry, beginning as an apprentice molder with the American Steel Foundries, Granite City, Ill. His apprenticeship lasted 3 years and following completion of the course, he became a journeyman molder with the Commonwealth Steel Co., Granite City. Later, he became associated again with the American Steel Foundries, first as assistant foreman, then as night foreman and finally as foundry superintendent. In 1918, he accepted a position as superintendent of foundries, Marion Steam Shovel Co., Marion, O., but returned to the American Steel Foundries in 1920 as works manager of the Sharon, Pa., plant of that company, and later as works manager of the Thurlow plant, Chester, Pa. Since 1925, Mr. Post has been vice president and works manager, Birdsboro Steel Foundry & Machine Co., Birdsboro.

William B. Coleman

WILLIAM B. COLEMAN, is president, W. B. Coleman & Co., Philadelphia. He is a past chairman of the Metropolitan Philadelphia Chapter of American Foundrymen's association and at present is its secretary-treasurer. He also is a past president of the American Society for Metals.

A graduate of the University of Pennsylvania, Mr. Coleman obtained his first commercial experience in the laboratories of the Midvale Steel Co., after which he was transferred to the open hearth department and in 1915 was made superintendent of open hearth furnaces. In 1916, he was sent to the Coatesville plant where he evolved a process for the manufacture of shell steel.

In 1918, Mr. Coleman became superintendent, Tacony Ordnance Corp., at the same time serving as civilian consultant, ordnance department, Washington, on the manufacture of steel for gears. After the war, the Tacony Corp., became one of the companies of the Penn Seaboard Steel Corp., and Mr. Coleman remained as general superintendent of that plant until 1922. At this time, he organized his own company.

Mr. Coleman has been prominent in technical association work, having been for a number of years a member of the American Chemical society, American Institute of Mining and Metallurgical Engineers, and the A.S.M.

Chambers R. Culling

CHAMBERS R. CULLING is vice president and general manager, Carondelet Foundry Co., St. Louis. Mr. Culling has taken an active part in the work of the association for many years and has been especially active in the work of the St. Louis district Chapter, where he is serving as a director and as chairman of its Apprenticeship committee.

Mr. Culling first began work in the foundry in 1911 during school vacations as an apprentice molder. Later, he attended classes in mechanics and patternmaking at the David Ranken Jr. School of Mechanical Trades. Following that, he became connected with the Remmers Pattern Co., St. Louis, as a patternmaker. In 1915, he began the study of mechanical engineering and at the outbreak of the World war in 1917 enlisted in the navy and served for 2 years on board the U. S. S. VESTAL in the engineers division. After discharge from the navy in 1919, Mr. Culling became foundry superintendent, Security Stove & Mfg. Co., Kansas City, Mo., and worked in that capacity until 1924 at which time he became superintendent, Carondelet Foundry Co., St. Louis. In 1935, he succeeded his late uncle, Horace R. Culling, as vice president and general manager of the Carondelet organization.

Mr. Culling is the immediate past president of the Gray Iron Founder's society.

Otto A. Pfaff

OTTO A. PFAFF is vice president and general manager, American Foundry Equipment Co., Mishawaka, Ind. He has been interested in the work of the association for many years and now is serving as a director of the recently organized Michiana Chapter of A.F.A.

Born in New York City, Mr. Pfaff received his early education in the schools of Yonkers, N. Y., and later attended New York university where he specialized in economics, organization and management. In 1916, he became associated with the Sand Mixing Machine Co., New York, the forerunner of his present company, the American Foundry Equipment Co. He has been connected with that company during his entire industrial career. In 1920, he was made treasurer; in 1926, secretary-treasurer; in 1932, vice president; and in 1935, vice president and general manager. He has been a director of the company since 1920.

Interested in organization work, Mr. Pfaff is a director of the Foundry Equipment Manufacturers association, and member of the U. S. chamber of commerce, Industrial Manufacturers association, National Association of Cost Accountants, and National Association for Management.

Fred J. Walls

FRED J. WALLS is manager of the Detroit offices of the International Nickel Co., Inc., New York. Mr. Walls, has been active on many committees of the association and is a director of the Detroit Chapter of A.F.A.

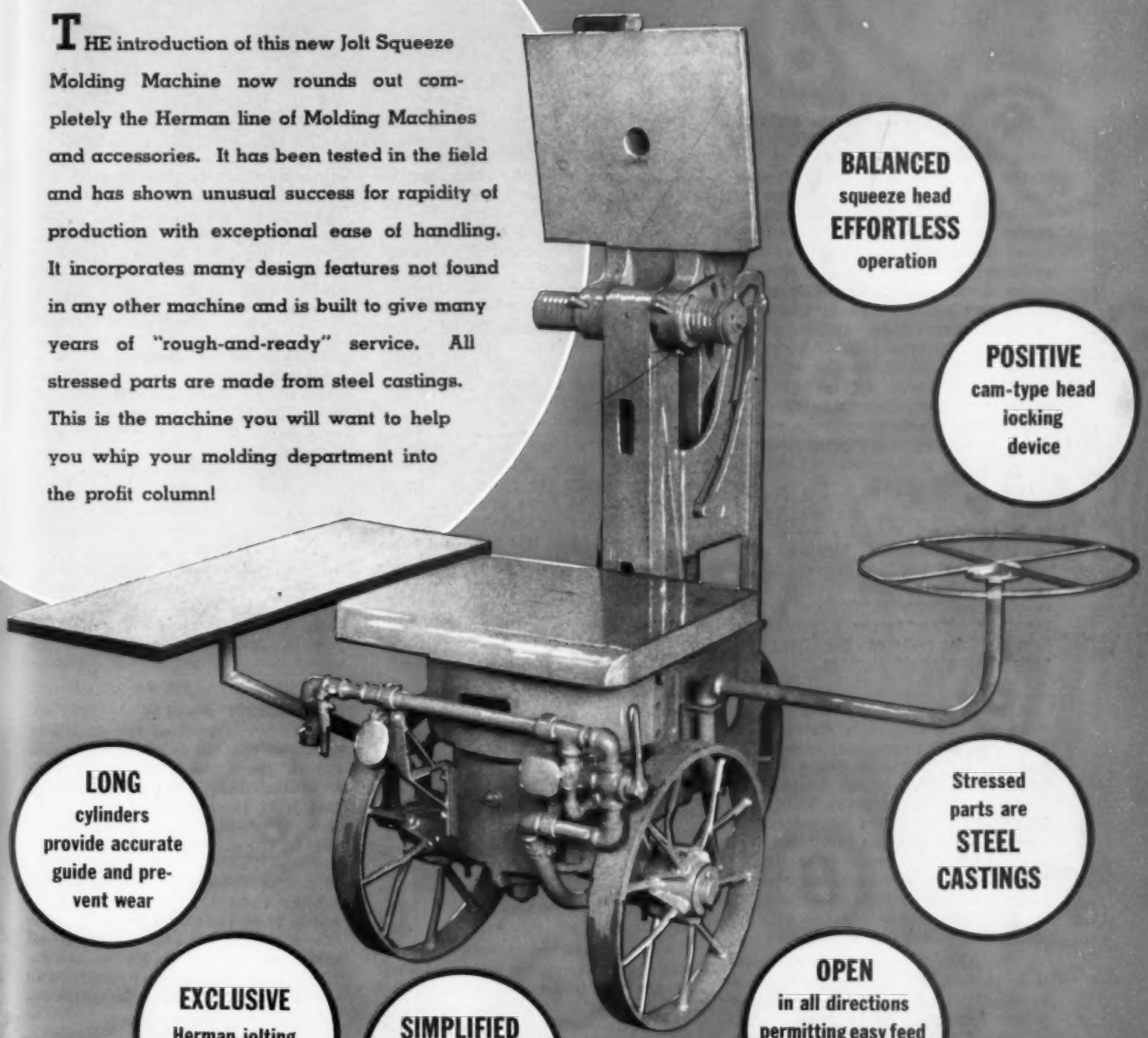
He was born in Oakland county, Mich., and received his technical education at the University of Michigan, Ann Arbor, Mich., where he specialized in metallurgy. On leaving school, he entered the employ of the Wilson Foundry & Machine Co., Pontiac, Mich., and rose to chief metallurgist. Later, he was made metallurgist, Eaton-Erb Foundry Co., Vassar, Mich. He assumed his present position in 1935.

Mr. Walls is very interested in association work and is a member of American Foundrymen's association and the American Society for Testing Materials. In 1930, he was the author of the annual exchange paper of the association to the Institute of British Foundrymen.

A new Herman designed to

PRODUCE PROFITS

THE introduction of this new Jolt Squeeze Molding Machine now rounds out completely the Herman line of Molding Machines and accessories. It has been tested in the field and has shown unusual success for rapidity of production with exceptional ease of handling. It incorporates many design features not found in any other machine and is built to give many years of "rough-and-ready" service. All stressed parts are made from steel castings. This is the machine you will want to help you whip your molding department into the profit column!



BALANCED squeeze head **EFFORTLESS** operation

POSITIVE cam-type head locking device

LONG cylinders provide accurate guide and prevent wear

Stressed parts are **STEEL CASTINGS**

EXCLUSIVE Herman jolting design

SIMPLIFIED control reduces operator fatigue

OPEN in all directions permitting easy feed from overhead sand hopper

MOLDING HERMAN MACHINES

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH, PA.

FOUNDRY DEVELOPMENTS AT SHORT RANGE

SOUTH AFRICAN foundry had the difficult problem of making a copper, water-cooled electrode which was about 3 feet long, 18 inches wide, and 3 inches thick containing a u-shape opening for water cooling which only left 1-inch metal thickness. In addition the casting must fit around one-fourth of the electrode which is about 2 feet in diameter so that the casting must be convex on the outside and concave on the inside. Difficulty of clean interior was avoided by making a copper shell instead of core, and filling it with dry sand. The molten copper then was poured around it. Twelve castings were made by the method without defects.

* * *

While pure quartz has a fusion point of only 2730 degrees Fahr., it is explained that its resistance to steel poured at temperatures between 2850 and 3100 degrees Fahr. is partly due to formation of iron oxide which cements the sand grains together. This forms a protective film which reduces the heat attack on the mold surface.

* * *

A 90-10 aluminum bronze cast in sand showed a tensile strength of 26,800 pounds per square inch, elongation of 7.5 per cent, and a brinell hardness number of 109. After heat treating at 1365 degrees Fahr. for 30 minutes, quenched in water, and drawn at 465 degrees Fahr. the tensile strength increased to 70,000 pounds per square inch, the elongation to 11.0 per cent, and the brinell hardness number to 130.

* * *

AN ALLOY iron which is said to possess excellent corrosion-erosion resistance to impurities in water contains 1.90 to 2.10 per cent silicon, 0.40 to 0.55 per cent manganese, 0.15 to 0.19 per cent phosphorus, 0.80 to 1.00 per cent copper, 0.30 to 0.40 per cent molybdenum, and 2.40 to 2.60 per cent total carbon.

* * *

A recent British patent describes a cupola containing two combustion zones one considerably above the other which is claimed to melt and superheat the iron in the same furnace. One combustion zone located in about the same position as in the regular cupola is termed the superheating zone while the other apparently half way between the charging door and the superheating zone is termed the melting zone. It is said with the high temperatures produced within the furnace, it is possible to reduce silica in the presence of iron —the reverse of what ordinarily occurs in the cupola. Cast irons produced under those reducing conditions is claimed to be superior to iron produced under severe oxidizing conditions.

* * *

TWO factors making manganese bronze more difficult to cast than tin bronze are the much greater tendency to form dross, and the high solidification shrinkage. Hence, it is necessary to use a gating technique which will avoid turbulent flow, and provide adequate feeding to all parts of the casting. Otherwise drosses may be carried into the mold cavity, and result in a defective casting.

* * *

Variable voltage equipment for driving a conveyor has prevented ripples on the tops of brass castings poured in molds on the conveyor. If molds are jerked as the conveyor moves intermittently while the molds are being filled, ripples result in the castings. Smooth starting and stopping are said to be assured by variable voltage equipment with damping motor control of acceleration and deceleration.

* * *

According to an investigation excellent results have been obtained in the electrodeposition of nickel from nickel chloride solutions. The particular solution employed contains 300 grams per liter of $NiCl_2.6\ H_2O$ and 30 grams per liter of H_3BO_3. Advantages claimed are large reduction in power cost, easier buffing, greater smoothness of thick deposits with lower tendency to form nodules, trees, etc., easy control of bath, less susceptibility of deposit to pitting, higher cathode efficiency, and lower heat generation with high amperage.

MOLYBDENUM additions to gray cast iron now can be made in the cupola, the electric furnace, or in the air furnace through use of briquets which contain exactly 2½ pounds of metallic molybdenum. The briquets are composed of a mixture of molybdenum trioxide and a sulphur-free pitch binder, briquetted under hydraulic pressure. They also may be used for adding molybdenum to steel.

* * *

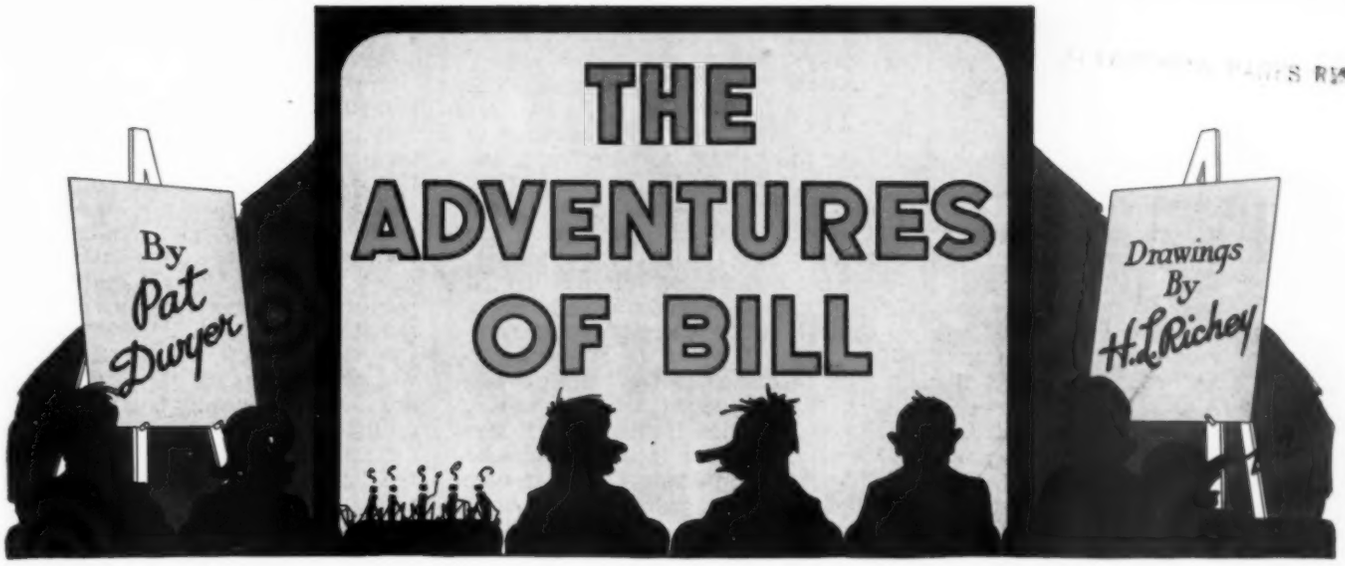
Endless screw conveyors for a fruit pulp press made of cast steel containing 0.25 to 0.35 per cent carbon, 0.60 to 0.70 per cent manganese, 0.25 to 0.35 per cent silicon, and 0.40 to 0.50 per cent molybdenum have given excellent service. They are 5 feet long with an overall diameter of 14 inches and a shaft diameter of 8 inches. Before use they are given a simple heat treatment of normalizing from 1700 degrees Fahr. which gives a tensile strength of 78,000 pounds per square inch, a yield point of about 48,000 pounds per square inch, and an elongation of 31 per cent in 2 inches.

* * *

A RECENT British patent describes a method for obtaining a skin or coating on a casting which differs from the interior. Briefly it states that the composition of cast iron, steel, etc., may be modified by lining the corresponding part of the mold with a destructable material such as open-mesh fabric or felt, carrying a selected metal, alloy or metallic composition. The lining may be made by saturating the material in boiled linseed oil and spraying the metal in powder form over it, rolling lightly and baking. Castings may be subjected to heat treatment.

* * *

Producing gray iron with a high total carbon content in the cupola depends upon a number of factors of which coke seems to be the most important. Increase in carbon content may be secured by use of a high bed composed of small size coke with a low ash content. Iron should be melted hot with a fluid slag.



"EVERY year," said Bill, "after I return from attending one of these foundry conventions, I feel as I imagine a python feels after he has swallowed a buffalo bull or maybe three or four billy goats tandem. Stuffed to the ears—I am not sure that a snake has ears—well, anyway stuffed full like a bologna sausage from head to tail he coils himself up into a comfortable knot for a couple of months and lets the rest of the world go by."

"I noticed you on several occasions," I said, "shoveling the food into your capacious maw like a coal trimmer in a boat taking on bunker coal. Some day one of the hoops will let go and then where will you be?"

"Where will I be? Right here my boy, johnny on the spot with every hoop intact, every line coiled snug and tight Bristol fashion and with the lights burning bright Sir! My comparison to the snake, as we literary lights say, was in the nature of an allegory or a hypothenuse or—well—or something. The idea I wanted to convey was that after one of the long programs my mental capacity is stretched to the elastic limit even as the python's skin is bulged from the inside as taut as the head of a drum in a kiltie parade. Probably some men are fast enough to take a string of technical papers in their stride, but I am not in that class. Papers on practical subjects written in ordinary English present no problem, but when an author soars away into the dim and rarefied atmosphere of pure science I drop out of the race. To the pure all things may be pure, but I am afraid I am too heavily tainted with original foundry grime to appreciate these flights into the higher altitudes. I need a month or two of complete rest with a dictionary on one side and an encyclopedia on the other side to assist in the process of digestion. By the time I get the general drift of the thing and feel like asking a few pointed questions, the opportunity has passed and there I am left like the last rose of summer hanging on a bush."

"What cute ideas you have, my dear. I can think of many objects to which you might be compared, but even in the most charitable and expansive mood I do not think I could persuade myself to compare you to a rose. A horned toad, now, or a cactus or maybe a frost bitten turnip overlooked by the gleaners—"

"So long as you do not ring in something about inter crystalline lattices," Bill smiled tolerantly, "or the random orientiation of the eutectoids, it is all right by me. Practically waterlogged one day with a load of that stuff I groped my way out of the meeting room, into the street and wandered around aimlessly until I found myself on the big bridge leading to Covington.

"Looking up and down the broad Ohio, densely populated on both sides, I speculated idly on present conditions as contrasted with the conditions prevailing for thousands of years while the great stream flowed toward the sea with not a human being in the vicinity, or along the banks from the junction of the Allegheny and Monongahela to where the turgid waters finally joined the still more turgid waters of the Mississippi, great father of waters."

He dashes from encyclopedia to dictionary

"What about the Indians? Seems to me I have seen references to where the noble red man did an occasional bit of scalping on both sides of the river in the mistaken idea that he could persuade honest white settlers from stealing his land."

"Well," said Bill, "I'll tell you. My first knowledge of the Ohio came through lurid boy's tales dealing with events of that same period. At the time I lived in a little town near the Atlantic seaboard and to my mind the Ohio was as far away geographically, as the thrilling adventures of the boy hero were in point of time. When this same gallant young lad was not floating down stream on a flat boat and potting an Indian now and again just to keep in practice, he was engaged in swimming from one side of the river to the other side. Where the coast was clear he rolled all his clothes in a bundle and held them with a rifle above his head with one hand. With an enemy in the vicinity he changed this technique. Trailing clothes and gun he submerged like a submarine with nothing but his nose showing above the surface.

"The stories may be true, but after spending practically the entire summer of my twelfth year in attempting without the slightest success to duplicate the marvelous feats I began to lose faith. Stark naked and with both legs and arms in good working order, I found no difficulty in crossing the river. Trying to do the same thing with a big rock clutched in one hand, held either above or below the surface, brought me on several occasions within the well known ace of losing any further

interest in life, liberty and the pursuit of happiness.

"Looking back now I think that experience sowed the first seeds of suspicion, a suspicion fairly well confirmed in later years, that all is not gold that glitters in the literary field. For example take that well known poem about a bird named Jim Bludsoe."

"You mean the gallant lad who held her nozzle agin the bank 'til every galoot was ashore and then went up in a puff of smoke before the smoke stacks fell on the ill fated Prairie Belle. What's wrong with that old classic of the river?"

"What's wrong with it, sez he! Why the whole thing is built up around a more or less popular misconception of an engineer's duties. What in the—well, what has an engineer to do with directing the passage of a ship? That is a function of the officer on the bridge. All the engineer has to do is control his engine in accordance with signals conveyed either by bell or speaking tube. 'Twould be a fine state of affairs indeed if the engineer sitting like a mole in the bowels of the ship could swing her right or left at his discretion or whim. 'Quick as a flash Jim turned and made for the willer bank on the right.' Har, har. That is a good one. Perched in an old rocking chair half or wholly asleep with the assistant watching the steam gage, Jim would not know whether the boat was nearer the right or left bank. Most assuredly he had no means of knowing that the boat could approach the bank closely enough for the passengers to get off. A river bank is not a dock.

"The whole poem is filled with inconsistencies. 'He wa'nt no saint. Them engineers is all pretty much alike. One wife in Natchez under the hill and one down here in Pike. A keerless man in his talk was Jim, but an awkward hand in a row, but he never pinked and he never lied. I reckon he never knowed how!'

" 'Twould be rather interesting to hear the opinion of wife No. 1 and wife No. 2 on that point. I am afraid Jamesy's reputation for honesty and truthfulness would pile up on the rocks when the ladies commenced comparing notes. Personally I don't care if he had a wife in every town between Cairo and New Orleans, but I resent the author's flippant reference to the fact followed by the statement that he never cheated or lied. How did he explain the discrepancies in his pay check? The average man has trouble enough on that point with only one wife.

" 'An' this was all the religion he had: To treat his engines well, never be passed on the river, and mind the pilot's bell.' Apparently his vows in Natchez under the hill and also down in Pike were not overlooked. His descendants with the same mania for never being passed, swarm over every road in the United States. These road hogs may be divided into two classes. Members of one class will not allow any other driver to pass. Members of the second class are not happy so long as any other car remains in front. This distinction probably stems from the maternal influence. Descendants of Natchez under the hill will not take anybody's dust. The boys from Pike stick grimly to the old motto, 'They shall not pass.'

" 'An' if ever the Prairie Belle caught fire, a thousand times he swore he'd hold her nozzle agin the bank 'til the last soul was ashore.' Sounds like something you might hear in Joe's Place saturday night after the boys had put away eight or ten rounds and gradually had raised the weight of the castings from a few hundred pounds to 50 tons. 'We has her all set to go, see (Business here of arranging four beer mugs to show position of ladles and cupola) one ladle here, one ladle here, see and the third and last ladle under the spout. The quebelow lining burns through on one side and we had to play the hose on it while getting the last tap into the ladle. We makes it though in spite of everything an' gets a casting, as purty a thing as ever ya seen. Not a spot on it. What's that? Well sir, when they put her on the scales she weighed exactly 100,000 pounds to a dot. Hey, garcon! One more all around.'

" 'The fire bust out as she cleared the bar and burned a hole in the night. Quick as a flash Jim turned and made for the willer bank on the right. Then there was runnin' and cursin' but Jim yelled out over all the infernal roar I'll hold her nozzle agin the bank 'til the last galoot's ashore!'

"The author apparently labored under the delusion that the boat was operated like one of these here now doodlebugs where the driver can hold the wheel with one hand and the throttle with the other. Jim may have been a very remarkable fellow, but I seriously doubt his ability to stand in the engine room of a boat approximately 300 feet in length and place his hands on the wheel in the Texas high up and forward. As for yelling the famous old boast about holding her nozzle agin the bank, he had as much chance of being heard in the noise and confusion, as a snagger had of being heard in an old time foundry rattler room.

"Obviously he did not do his shouting from the engine room. He must have been above deck some place where he had some chance of being seen as well as heard. Now listen carefully to this line of reasoning. If he could trust his engines to run by themselves while he paraded around the deck shouting his battle

(*Concluded on page* 58)

All set to pour a job six-up with a spare man to watch her up and another fellow waiting to touch off the vents

SPO TALKS PRACTICALLY

A frankly literal record of a foundry situation — and how it was handled.

In this instance the recommendations of the SPO staff, in collaboration with the user, caused four stove elbows to "grow where one had grown before".

The Situation. The 7-inch cast iron elbow shown at the right had previously been made in two pieces, which were bolted together. The pattern equipments were matchplates of half elbows. One man put up about 150 half-elbows, or 75 complete elbows, in a day. A second man bolted the parts together. The weight was approximately 6 lbs. 4 oz.

The Contribution. Patterns were made for casting four elbows per mold in green sand, except a small core for the damper regulator louvres. One pattern plate, mounted on a SPO 213-D Jolt Squeeze Strip Machine, suffices for both cope and drag molds. The cast iron flasks, with bars cast in, are also alike. The green sand core is made on a SPO 506 Jolt Rock-Over Pattern Draw Machine.

The Result. Two men now turn out approximately 20 molds per hour, or 80 castings. Output averages 40 elbows per man hour as against 9¾ formerly. Consequently, four 7-inch elbows are now "growing where one grew before". Weight has been cut 10 oz. or exactly 10%—to 5 lbs. 10 oz.

The services of a SPO engineer are at your call.

(Lower illustration — "as before")

SPO designs and builds both molding machines and pattern equipment, and guarantees them unconditionally to produce castings which will be in accordance with your specifications.

SPO INCORPORATED

Manufacturers and Specialists in Molding Machines, Vibrators, and Patterns for Production

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(*Concluded from page* 56)

cry, why could he not trust them to continue running and thus hold the nozzle agin the bank, while he hopped down the gangplank with the other refugees?

"'An' sure's yer born they all got off afore the smoke stacks fell and Bludsoe's ghost went up alone in the smoke of the Prairie Belle!' Instead of being a tribute to the engineering fraternity, the poem is a libel. Probably the river boat engineers were no saints. Some of them, as the late Bro. Kipling remarked, may have played with the snaffle bars of matrimony as a lady plays with a glove, but I am sure none was ever so silly as to cook like a lobster in his shell where no necessity existed.

"Talking about going up like a puff of smoke reminds me of a story recently relayed by my old friend Len Schad in Portland, Oregon. A foundryman out in that part of the country makes a good many castings for paper and pulp mills, all kind of castings, iron, bronze and lead. Some time ago he made a lead pipe connection, a good size hunk of a casting weighing about 1500 pounds. The casting was cleaned in the afternoon and ready to ship in the morning. During the night the foundry caught fire and burned to the ground. The customer called for his casting in the morning and the foundryman poked around in the ashes, but could not find it. He brushed away the dust and ashes and found that the heat of the fire had melted the casting and all the metal had run down a rat hole."

"Must have been some rat hole," I said, "to absorb 1500 pounds of metal."

"More than that," said Bill, "spilled down the rat hole in many a foundry and no one knows where it has gone!"

Gray Iron Society Holds Annual Meeting

A REVIEW of progress during the past year, and consideration of future activities featured the annual meeting of the Gray Iron Founders' society held at the Netherland Plaza hotel, Cincinnati, May 15.

Following the meeting, the new board of directors met and elected the following officers: President, C. J. Miller, president, Fremont Foundry Co., Fremont, O.; vice president, R. E. Kucher, vice president, Olympic Foundry Co., Seattle; secretary, J. H. Pohlman, president, Pohlman Foundry Co., Buffalo; treasurer, S. C. Mefford, Auburn Foundry, Inc., Auburn, Ind.

In his presidential report, C. R. Culling, Carondelet Foundry Co., St. Louis, briefly reviewed the history of the society during the past few years, and emphasized the importance of the various activities to the members. Looking toward the future, President Culling stressed the need for greater co-operative effort. If the industry is to progress, it must know more about its own business, educate its market on the many valuable properties of gray iron castings; study and apply the cost data of the society, and utilize to the fullest the services of the society.

W. W. Rose, executive vice president of the society presented a detailed summary of activities undertaken to carry out the objectives of the organization. Mr. Rose discussed the national advertising of the society during the past year; the monthly bulletin, cost activities; finances; governmental reports; legislation; membership; research statistics; etc.

Following the report of the nominating committee, the following were elected directors: Three-year term, C. R. Culling, vice president, Carondelet Foundry Co., St. Louis; A. L. Katelman, manager, Katelman Foundry & Mfg. Co., Council Bluffs, Iowa; S. C. Mefford, treasurer, Auburn Foundry, Inc., Auburn, Ind.; C. J. Miller, president, Fremont Foundry Co., Fremont, O.; R. D. Phelps, president, Francis & Nygren Foundry Co., Chicago; Peter E. Rentschler, president, Hamilton Foundry & Machine Co., Hamilton, O.

One-year term, D. A. Cullinan, president, Western Foundry Co., Chicago; T. I. Curtin, president, Waltham Foundry Co., Waltham, Mass.; A. C. Denison, president, Fulton Foundry & Machine Co., Cleveland; William J. Grede, president, Liberty Foundry, Inc., Wauwatosa, Wis.; R. E. Kucher, vice president, Olympic Foundry Co., Seattle; Hugh Martin, president, Detroit Gray Iron Foundry Co., Detroit; W. F. Mosser, secretary-treasurer, W. F. Mosser & Son, Allentown, Pa.; J. H. Pohlman, president, Pohlman Foundry Co. Inc., Buffalo; R. J. Redmond, secretary-treasurer, Buckeye Foundry Co., Cincinnati; A. J. Rumely Sr., president, LaPorte Foundry Co., LaPorte, Ind.; W. L. Seelbach, secretary-treasurer, Forest City Foundries Co., Cleveland; Edgar Spencer, treasurer, Philbrick-Booth & Spencer Co., Hartford, Conn.

Book Review

Alloy Cast Irons, a project of the Gray Iron division, American Foundrymen's association, semiflexible imitation leather, 270 pages, 6 x 9 inches, 111 charts and illustration, 73 tables. Published by the association and supplied through THE FOUNDRY, Cleveland, for $3.00 and in Europe by the Penton Publishing Co. Ltd., London.

Alloy Cast Irons covers the effect of 18 different elements on the various properties of gray, white and chilled cast irons. Information is given on the effect of aluminum, bismuth, carbon, chromium, cobalt, copper, magnesium, manganese, molybdenum, nickel, phosphorus, silicon, sodium, sulphur, titanium, tungsten, vanadium and zirconium on such properties as tensile, transverse, shear, torsional and impact strengths, hardness, deflection, machinability, wear resistance, heat resistance, corrosion resistance, mass and section, electrical properties, thermal properties, chill, etc.

The book also discusses the forms in which alloying elements are available commercially and the different types that are added to various melting units. General foundry practice used in the manufacture of alloy cast iron, covering such subjects as melting, molding sands, heat treatment, shakeout practice, cleaning and finishing, etc., also is covered.

Of special interest should be the chapter devoted to composition, mechanical properties, uses and service data on many types of alloy cast irons in commercial applications. For those desiring still more complete information on the subjects covered, a 25-page bibliography is available.

Firms Consolidate

Consolidation of Speeder Machinery Corp., Cedar Rapids, Iowa, manufacturers of excavating and materials handling shovels, draglines, cranes with the Shovel division, Link-Belt Co. has been announced. For the present each organization will continue to operate separately.

W. G. Dixon & Associates, 1218 Olive street, St. Louis, has been made agent for the Harnischfeger Corp., Milwaukee in the St. Louis district.

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Reading

REGULAR monthly meeting of the Reading Foundrymen's association was held at the Wyomissing club, Reading, Pa., on Tuesday, April 18. Julian B. Greenstreet, president of the group, presided and introduced the speaker, K. V. Wheeler, vice president and general manager, Lebanon Steel Foundry Co., Lebanon, Pa.

Mr. Wheeler spoke on, "Consumer-Foundry Co-operation on Design." He pointed out to the members present the importance of the foundry to work with engineers who design products for which castings are ordered so that the customer is acquainted with the technical foundry problems that sometimes are involved in making these castings. Mr. Wheeler pointed out that through this co-operation changes in design often may be made which will permit the foundryman to deliver a more efficient casting. His talk on the subject was very interesting and was illustrated by 60 slides.

Fifty-four members attended the meeting and one new member was welcomed into the association. It was decided that since the next meeting date conflicts with the annual meeting of the A. F. A. at Cincinnati, the next meeting date would be changed.—*H. C. Cummings, secretary.*

Detroit

CONTROL of iron quality in the manufacture of chilled car wheels came in for detailed consideration at the May 11 meeting of the Detroit chapter at the Fort Shelby hotel. Dinner attendance was 104, considerably surpassing expectations, and including a number of foundrymen who came in from state locations such as Flint, Muskegon, etc.

Prior to the technical session, Chairman Cheney introduced Jesse H. Stoddard, vice president of the Detroit Testing Laboratory, who recalled the early days of car wheel manufacture and testing. Mr. Stoddard also announced that farewells were in order for Mr. Cheney who on June 1 will move to St. Paul to take charge of the Griffin Wheel Co. there, to be succeeded at Detroit by P. H. Loveland. Mr. Cheney has been well liked by foundrymen in this district, and his leaving is a distinct loss.

A 30-minute sound film portraying the manufacture of chilled car wheels and produced under the direction of the Association of Chilled Car Wheel Manufacturers in Chicago was shown and proved to be highly interesting. It was pointed out in the film that there are now in service on the nation's freight cars a total of 24,000,000 chilled iron wheels, involving annual replacement of 1,250,000, ranging in weight from 600 to 800 pounds.

Technical address was delivered by S. C. Massari, consulting metallurgist for the Association, who spoke on "Controlled Cupola Operation." He described in detail how by means of automatic gas analysis it was possible to determine accurately the composition of gases emanating from a hot-blast cupola and then relate these data to such factors as loss of silicon, loss of manganese, carbon content of the iron, and the like. An Orsat type of gas analyzer was employed, giving figures on percentages of CO, O_2 and CO_2.

A graph was presented relating the percentage of CO_2 in the combustion gases to the loss of silicon and manganese in the iron. For example, with 15 per cent CO_2, the loss of silicon was 35 per cent and manganese 40 per cent, while with only 10 per cent CO_2, the loss of silicon was 11 per cent, and manganese 16 per cent. Similar relationships were obtained for the stage of combustion or percentage of CO_2 in the gases, and the carbon content of the iron. These determinations brought up consideration of the matter of economy of operation versus the stage of combustion, since the higher the CO_2 content in the gases, the less coke is required in operation of the cupola.

Loss of silicon and manganese are vital factors in production of iron for car wheels since the depth of chill on a wheel is directly proportionate to the silicon content in the iron. In practice, an effort is made to maintain silicon content within limits of plus or minus 0.05 per cent. —*A. H. Allen.*

Conn. Nonferrous

REGULAR meeting of the Connecticut Nonferrous Foundrymen's association was held April 19 at New Haven, Conn., with 53 members attending. A. H. Hinton, Aluminum Co. of America, Fairfield, Conn. showed a most interesting sound film, "Aluminum, Mine to Consumer" which illustrated the processes through which aluminum goes from ore to the various finished products. Following this was a lengthy discussion period which was both educational and entertaining.

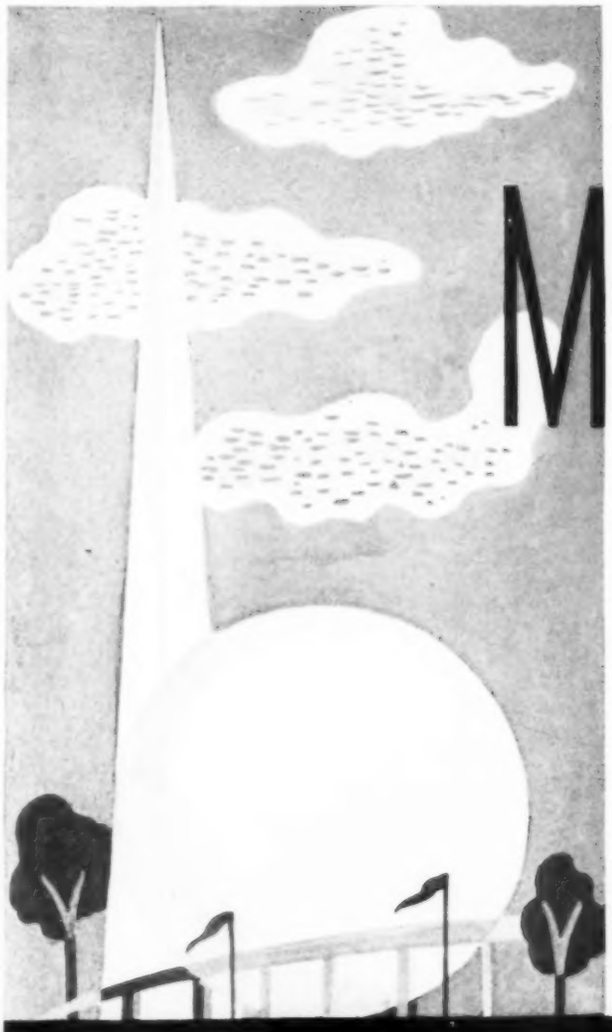
Fred B. Clarke, chairman of the entertainment committee announced that the sixth annual entertainment meeting would be held Friday, June 16 at Wilcox's Pier restaurant, Savin Rock, West Haven, Conn., festivities beginning at 5:30 p.m. and dinner being served at 7 p.m.—*Louis G. Tarantino, secretary.*

Birmingham

FRIDAY night, March 17, a large group of foundrymen and their friends met at Tutwiler hotel, Birmingham to listen to a most interesting talk illustrated with slides on the "Early History of Iron Making in Alabama", by Henry J. Noble, one of the chapter's members.

Mr. Noble went into great detail

(*Continued on page* 64)



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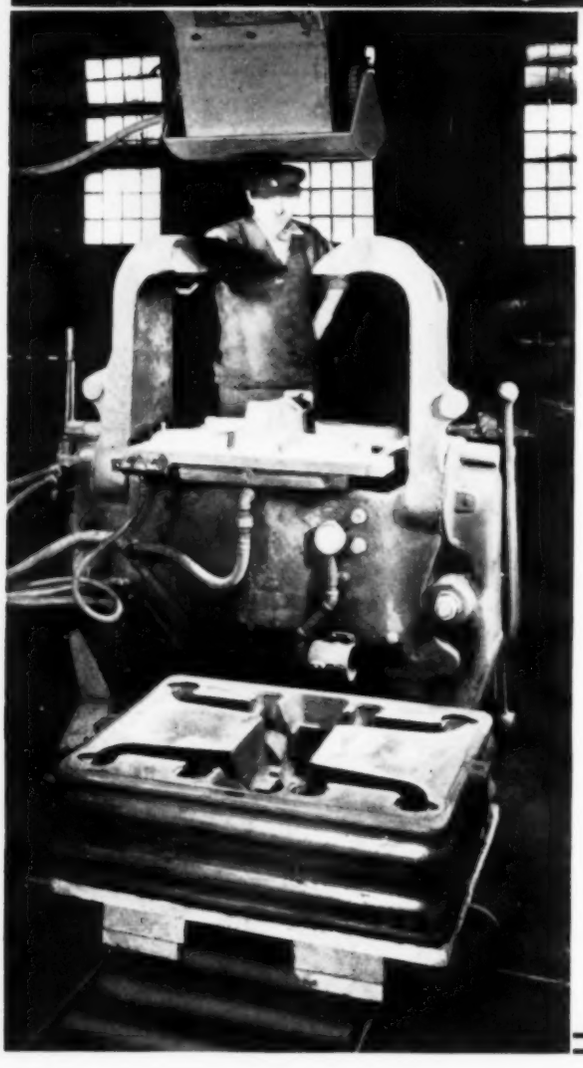

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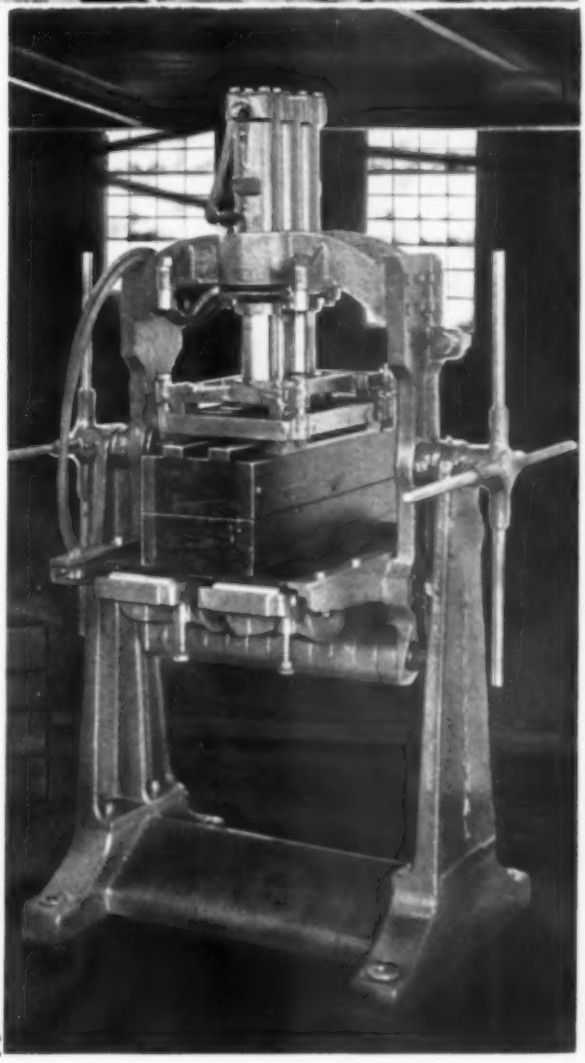
UPPER RIGHT-Type G Jolt ram, Power turnover, Foot draw Machine

LOWER RIGHT-Type REC machine for Clamping, Turning over and Drawing.

We build 14 Standard Types of machines for Cores, including 5 designs of Core Blowers, as shown in Section 7 of our catalog.



MOLDING MACHINE CO.
Chicago, Illinois

(*Continued from page* 60)
regarding the history of early furnaces in the state, emphasizing the fact that most of the pioneers were located near their ore supply, (which was brown ore in most cases), and used wood in the surrounding forest to make charcoal for the fuel. These furnaces also were located at or near a source of water to generate power.

His talk dealt with the furnaces up until about the time of the war between the States and ended with a brief description of the first furnace in the state to use coke as fuel. That furnace was located at Oxmoor in Shades valley, and the original owner later sold it to what is now the Tennessee Coal, Iron & Railroad Co. Mr. Noble brought out the fact that most of the iron produced in the state prior to the war between the states was made in what he referred to as the five iron making counties: Calhoun, Cherokee, Talladega, Shelby and Etowah. Up to that time the Birmingham district had never produced any iron.

At the conclusion of his talk there were many questions asked by the members present and Mr. Noble showed by the promptness and accuracy with which he answered that he was on thoroughly familiar ground.—*W. O. McMahon, secretary, treasurer.*

California

NORTHERN and Southern California chapters of the A.F.A. held a joint meeting at the Fresno hotel, Fresno, Calif., April 22. The afternoon was given over to inspection trips through the Twining Laboratories and through the Roma Winery. C. B. Tibbetts, Los Angeles Steel Casting Co., Los Angeles, presided at the dinner meeting at which 110 were present.

Principal speaker was Alfred M. Paul, manager, California Products Co. Mr. Lohse, secretary of Fresno county Chamber of Commerce represented Mayor Holman. Several of the officers from each chapter contributed to the evening's success. Scrap iron and steel exportation was discussed by Bill Kean, secretary of the Pacific Coast chapter of the Scrap Iron and Steel institute. Judge Sylvester J. McAtee, San Francisco gave an encouraging report on the coke tax question on which he has been working for a year. A suggestion was made to hold the 1940 joint meeting as a 2-day foundry conference at Fresno State college. The suggestion was so well received that a committee from each chapter is to be appointed to work on the idea.

The meeting was concluded with group singing and dancing.—*George L. Kennard, secretary, Northern California chapter.*

Wisconsin

OVER 700 members and friends of the chapter attended the April 21 meeting of the Wisconsin chapter of the A. F. A. held at the Schroeder hotel, Milwaukee, to hear Senator Edward R. Burke of Nebraska discuss the Wagner labor act and his proposed amendments. This is probably the largest regular A. F. A. chapter meeting yet held. The Industrial Association of Wisconsin and the Employer's Association of Milwaukee co-operated with the chapter in staging the meeting.

Senator Burke commented on the deep swing in public opinion toward making the law a fair one and the board that administers it an impartial body. The senate was at first opposed to hearings on amending the act but its attitude has changed partly as a result of national polls of public opinion which show more than 75 per cent in favor of revamping the act. The senator mentioned also a petition sent to the senate signed by more than 50,000 small business men from 43 states asking that the law be amended. He outlined the major points in an amendment now before the Senate. The senator pointed to the new labor bill of Wisconsin now waiting signature by Governor Heil as a hopeful sign that the inequalities of the national measure would be rectified.

Election of officers for the coming year also took place at this meeting of the chapter. William J. MacNeill, Federal Malleable Co., West Allis, Wis. was made president; B. D. Claffey, General Malleable Corp., Waukesha, Wis., vice president; A. C. Ziebell, Universal Foundry Co., Oshkosh, Wis., secretary, Milton J. Carpenter, Carpenter Bros., Milwaukee, treasurer. Directors elected for 3 years are: R. S. MacPherran, Allis-Chalmers Mfg. Co., Milwaukee; and T. E. Ward, Badger Malleable Co., South Milwaukee, Wis. E. L. Roth, Motor Castings Co., Milwaukee, was elected a director for 1 year.

Buffalo

MEETING of the Buffalo chapter of the A. F. A. was held Monday evening, May 1, at the Hotel Touraine, 66 attending the dinner

(*Continued on page* 66)

Candid camera shots of Wisconsin meeting. Photos courtesy John Bing, A. P. Green Fire Brick Co., Milwaukee

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A PRODUCT of modern research—that's a true description of Norton Resinoid Wheels for foundry grinding. In the Norton laboratories there's a group of scientists that specializes in resinoid bond development. Not only have they made many important improvements in the bond formulae but have also developed an elaborate control system that improves production quality and uniformity.

These laboratory developments coupled with an entirely new production department with the very latest available equipment have resulted in new standards of quality for resinoid wheels—wheels that are cutting cleaning room costs for many foundries. Let Norton engineers study your jobs and give you the benefit of these improved wheels.

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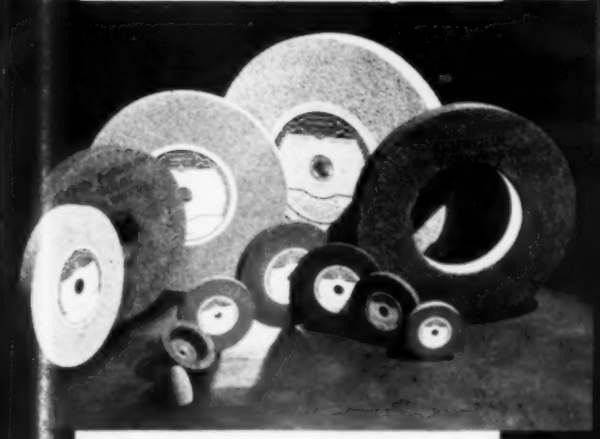


There's a complete line of Norton Wheels for every job in the foundry

W-709

(*Continued from page* 64)

and 85 the meeting. W. J. Corbett, Atlas Steel Casting Co., and vice chairman of the chapter, officiated in the absence of M. W. Pohlman. Mr. Corbett introduced Mr. Mellor, Socony-Vacuum Oil Co. who briefly described the sound motion picture, "The Inside Story" which gave the complete story of what takes place on the inside of motors and the importance of proper lubrication for all types of bearings. The picture left no doubt in the observer's mind as to what steps to take in order to care for these types of machines in his plant.

Following this picture, Mr. Corbett opened the regular meeting. Announcements of the National safety conference, the annual foundry convention to be held in Cincinnati and the annual stag picnic of the chapter to be held in June, were made. At the picnic officers and directors of the chapter will be elected.

H. W. Kelly, Meehanite Corp. of Chicago was introduced and he discussed "Modern Developments in Cupola Operation and General Improvements in Foundry Practice." His talk was accompanied with interesting slides depicting these late developments. He also predicted the drying of cores by radio beams.—*J. R. Wark, secretary.*

Northern Iowa

JOINT meeting with a Waterloo Technical society featured the regular monthly meeting of the Northern Iowa Foundrymen's association held at the Russell-Lamson hotel, Waterloo, Iowa on April 27. Robert S. Archer, chief metallurgist of the Chicago division, Republic Steel Corp., spoke on "Metal Economics".

Mr. Archer stated that metal economics means use of the proper metal in the proper place. Metal chosen for a particular job is usually the result of a compromise between utility and cost. Of the 92 known elements in the periodic system, only 12 are in common use as base metals. Any one of the 12 which forms the base metal of an alloy usually is in excess of 50 per cent in the alloy. Cost of the metal is determined by its prevalence in the earth's crust, percentage of metal in the ore and ease and cost of reducing the ore. The speaker then compared the use of aluminum and magnesium castings. While magnesium is lighter and stronger than aluminum, difficulties experienced in melting, molding and machining make the final cost of the casting much greater than that of aluminum. Magnesium castings have considerable application in airplanes where reduced weight is reflected in increased pay load.

Mr. Archer then showed several slides dealing with the growth of pig iron production and pig iron as compared to steel. This brought out the usual trend in metals where the beginning is usually slow, followed by a rapid climb and then a leveling off. In the case of pig iron and steel production, the two curves followed closely until the last 5 to 10 years when production of steel was consistently greater than production of pig iron due to increased use of scrap in steel. In concluding his talk, Mr. Archer stated that the metallurgist is the one who applies metal economics.—*R. E. Wilke, president.*

Philadelphia

JOINT meeting of the American Welding society and Metropolitan Philadelphia chapter of the A.F.A. was held April 17 at the Engineers club, Philadelphia. Harold Henszey, chairman of the A.F.A. chapter presided, with 150 in attendance. Charles W. Briggs, technical adviser, Steel Founders' society, Cleveland, discussed, "The Welding of Steel Castings and Cast-Weld Fabrications."

Mr. Briggs covered the subject in three phases namely: Repair of steel castings by welding; construction of parts by welding casting to casting; construction of parts by welding a steel casting to a steel forging or rolled steel plate. He touched upon inherent difficulties in production of steel castings which give rise to the necessitated repair by welding of surface blemishes. He also showed how welding progress in the steel foundry has kept pace with welding developments elsewhere, described the procedure control that is being carried on throughout the industry and explained the technique of welding steel castings. The welding of alloy steel castings, as well as carbon steel castings, was considered.

The speaker presented information concerning the heat affected zone and a comparison of physical properties of the weld and the heat affected zone. He brought out very clearly that welding is a part of the manufacturing process of steel castings and that it is being handled throughout the industry in a competent manner.

Mr. Briggs offered the suggestion that when the design of a cast steel structure becomes complicated or intricate, that it be broken up into parts so that they may be cast separately and then assembled by welding or bolting. He then presented a number of illustrations showing how this principle could be applied. A number of illustrations also were presented showing the manner in which steel castings are being used in a welded fabrication.

President's night was celebrated April 21 at which 257 members and friends of the Metropolitan Philadelphia chapter met at dinner at the Engineers club to pay tribute to their fellow member and national president, Marshall Post, and to hear a unique and interesting talk by Dr. Michael Dorizas. University of Pennsylvania lecturer and traveler. Dr. Dorizas spoke on the "European Situation" and showed colored motion pictures, taken by him, of many of the countries of Europe.

Marshall Post told of his visits to the other chapters throughout the country. The incoming officers of the association were present together with C. E. Hoyt, executive vice president of the association. It was the largest meeting ever held by the chapter and no technical papers were discussed.—*J. T. Fegley, chairman, publicity committee.*

New York-New Jersey

THE topic "Steel Castings" was discussed by R. A. Gezelius, metallurgist, Taylor-Wharton Iron & Steel Co., Highbridge, N. J. at a joint meeting of the New Jersey chapter of the A. S. M. and the Metropolitan New York-New Jersey chapter of the A. F. A. at the Essex house, Newark, N. J., April 17. About 200 members and guests of the two chapters were present.

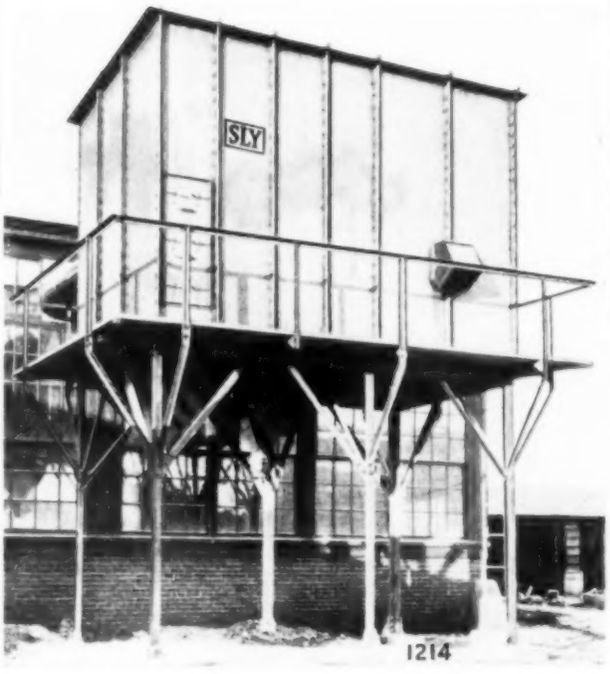
Before introducing the speaker of the evening, G. M. Rollason, chairman of the New Jersey A. S. M. chapter presented Donald J. Reese, chairman of the N. Y.-N. J. A. F. A. chapter who briefly greeted the combined group.

Mr. Gezelius gave a brief resume of the history of steel castings, tracing the industry's growth from earliest beginnings following the Civil war to the present day when a total of 175 steel foundries in the United States produce approximately 80,000 tons of castings per month. The speaker then discussed importance of design upon production of sound castings, showing with slides and sketches how necessary it is that hot spots and points of stress concentration be eliminated to produce satisfactory castings. Maximum benefits are derived in this respect when the finished design is the result of a co-operative effort of both foundryman and the engineer.

In the process of assemblying by welding a number of simple castings to produce a highly complex structure, Mr. Gezelius foresaw one of the most important steel foundry

(*Continued on page* 68)

YOU SAVE WITH SLY DUST FILTERS FOR *Every* FOUNDRY NEED



A large Sly Type No. 360 flat bag filter engineered for large dust control installations. The steel case is air tight and weatherproof. The special bags can be mounted in rows two or three tiers high.

You can have the size of dust filter that exactly fits your particular needs.

If you want to collect dust from several sources, such as, silica washing cores, core rubbing, core cutting, molding, cleaning castings (blasting and tumbling), and grinding, we suggest a *large* Sly Dust Filter; but if you want to collect dust from only one or a few of these sources, then we recommend a *small* Sly Unit Dust Filter.

Regardless of size Sly Dust Filters offer you unmatched advantages. They are simple in design, easily installed and economical in space and power. The Sly special flat cloth filter bags combined with mechanical shaking device give you more and better filtering per dollar invested.

Much lower in price, this inexpensive Sly Unit Filter is constructed of the same sturdy material and fine craftsmanship prominent in all large Sly Dust Filters. Hand operated or motor driven shaker can be furnished.

With all its advantages, Sly Dust Control is *not* expensive. Hundreds of installations in foundries prove this.

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BLAST CLEANING EQUIPMENT — SLY — TUMBLING MILLS

DUST CONTROL EQUIPMENT FOR EVERY INDUSTRIAL PURPOSE

(*Continued from page 66*)

developments to come in the next 3 or 4 years.

While a few years ago all castings were used in the annealed condition, normalizing is common practice today with an increasing trend toward quenching, aging and differential heat treatments. Mr. Gezelius concluded his very interesting and highly informative talk by citing the advantages of steel castings including the facility to place metal where it is most needed, lower machining costs, obtaining different hardness at the surface as compared to the core and the high rate of production possible.—*K. A. DeLonge*

New developments in foundry equipment and supplies were discussed by W. A. Phair, the *Iron Age*, New York, before the Metropolitan New York-New Jersey chapter at the Essex House, Newark, N. J., May 8. He described a number of innovations in practices and equipment both in this country and abroad and amplified his remarks with chalk sketches and photographs.

W. E. Day Jr., Mack Mfg. Co., New Brunswick, N. J., was elected chairman of the Metropolitan New York-New Jersey Chapter of the American Foundrymen's Association for the 1939-40 fiscal year. Other new officers are R. J. Allen, Worthington Pump & Machinery Co., Harrison, N. J., vice-chairman; W. A. Phair, the *Iron Age*, New York, secretary; and Samuel Frankel, H. Kramer & Co., New York, treasurer.

The following were elected directors to serve for 2 years: I. D. Parker, Climax Molybdenum Co., New York; George Hochgesand, American Brake Shoe & Foundry Co., Mahwah, N. J.; Sam Tour, Lucius Pitkin, Inc., New York; J. W. Reid, Robbins Conveying Belt Co., Passaic, N. J.; and Donald J. Reese, International Nickel Co., New York.

Directors elected for 1-year terms are: R. A. Gezelius, Taylor Wharton Iron & Steel Co., High Bridge, N. J.; T. J. Wood, American Brake Shoe & Foundry Co., Mahwah, N. J.; J. Nevin, Otis Elevator Co., Yonkers, N. Y.; R. E. Nesbitt, Pratt Institute, New York; and W. G. Reichert, Singer Mfg. Co., Elizabeth, N. J.

Animated discussion of the advantages and disadvantages followed Mr. Phair's description of the English bottom-tapping cupola. The speaker stated that the developers of this cupola claimed practically no carbon pick-up and little sulphur pick-up due to the short time in which the iron is in contact with the incandescent coke. Several members claimed that similar results could be achieved with orthodox cupolas if the proper practice was used and it was pointed out that the construction features of the bottom-tapping cupola limit its application. Considerable interest was evidenced in Mr. Phair's explanation of the construction of an English cupola for melting low carbon and silicon iron.

Both the melting and superheating chambers have independent blast sources, according to the speaker's description. Other devices described were a slag wool collector, an Italian arrangement for preheating the blast by utilizing the heat from the pouring spout, a French pressure casting machine and uses for the abrasive grains contained in scrapped grinding wheels.—*B. K. Price.*

Northeastern Ohio

APPROXIMATELY 250 members and guests of the Northeastern Ohio Chapter, A. F. A., attended the last meeting of the season May 11 at the Cleveland Athletic club to see and hear Harry Dietert, H. W. Dietert & Co., Detroit, demonstrate and explain why sand behaves as it does under the widely varying conditions to which it is subjected in the foundry.

Before the technical meeting started the retiring chairman, L. P. Robinson, Werner G. Smith Co., instructed the secretary to cast a unanimous ballot for the following slate of officers for the coming year as proposed by the nominating committee: Chairman, Ernest F. Hess, Ohio Injector Co., Wadsworth, O.; vice chairman, F. Ray Fleig, Smith Facing & Supply Co., Cleveland; secretary (re-elected), J. H. Tressler, Hickman, Williams & Co., Cleveland; treasurer (re-elected), R. F. Lincoln, Osborn Mfg. Co., Cleveland. Directors for 3-year term, Leroy P. Robinson, Werner G. Smith Co., Cleveland; Fred A. Stewart, National Malleable & Steel Casting Co., Cleveland; and E. J. Hedlund, Urick Foundry Co., Erie, Pa. Frank L. Barton, Fulton Foundry & Machine Co., Cleveland, was elected director for one year term.

According to Mr. Dietert the following properties are important in the selection of new sands: Grain size, permeability, clay content, refractoriness, grain distribution, amount of fines, durability, dry strength, amount of objectionable materials, expansion and contraction at a temperature of 2500 degrees Fahr., hot strength at elevated temperatures, deformation or plasticity, grain shape. Each of these factors was taken up in turn, illustrated by charts and running comment and by actual demonstration of quantities of sand passed through the various sand testing and measuring devices.

Touching on the liability to error in the old fashioned feel test he showed two samples of sand, one of which felt coarser than the other and therefore apparently presenting higher permeability. Actual test on the permeability apparatus showed that the permeability of the finer sand was 130 while that of the coarser sand was only 40. As a factor in determining permeability the speaker claimed that the amount of sand on three adjacent screens should amount to approximately 75 per cent of the total.—*Pat Dwyer.*

Michiana

MEMBERS of the Michiana chapter of the A.F.A. turned out in large numbers for the final lecture meeting of the year, April 25, Hotel Oliver, South Bend. Approximately 125 members attended the dinner and the attendance had swelled to 160 by the time L. P. Robinson, Werner G. Smith Co., Cleveland, began his talk on core room troubles. Mr. Robinson's talk covered proper selection of core sands and binders, baking, venting and inspection. The practical discussion on these points was interlaced with a series of comedy illustrations that sent the members away with a recollection of a wonderful evening of entertainment as well as a highly informative discussion. The question and answer session was enjoyed particularly by a large number of core room workers who attended the session.

Since this meeting was the final session for the season the chapter elected its officers and directors for next year. The chapter had desired to have M. J. Lefler continue as chairman of the group for the coming year but due to his having changed business connections and being located in Chicago, his resignation was accepted with considerable reluctance. The group gave a rising vote of appreciation to Mr. Lefler for his services in helping establish the chapter and guiding its first meetings.

Officers elected for the next year are: Chairman, A. C. Arbogast, vice president, Northern Indiana Brass Co., Elkhart, Ind.; vice chairman, M. F. Doty, manager castings division, Clark Equipment Co., Buchanan, Mich.; secretary-treasurer, L. L. Andrus, sales manager, American Foundry Equipment Co., Mishawaka, Ind. Two new directors were elected, Edward Bumke, Oliver Farm Equipment Co., South Bend, Ind. and A. F. Fries, Peru Foundry Co., Peru, Ind. Other directors will continue in office for the next season. The officers commented on the fact that the members had shown a remarkably fine attendance during the first season's meetings and in every way participated in the pro-

(*Continued on page 72*)

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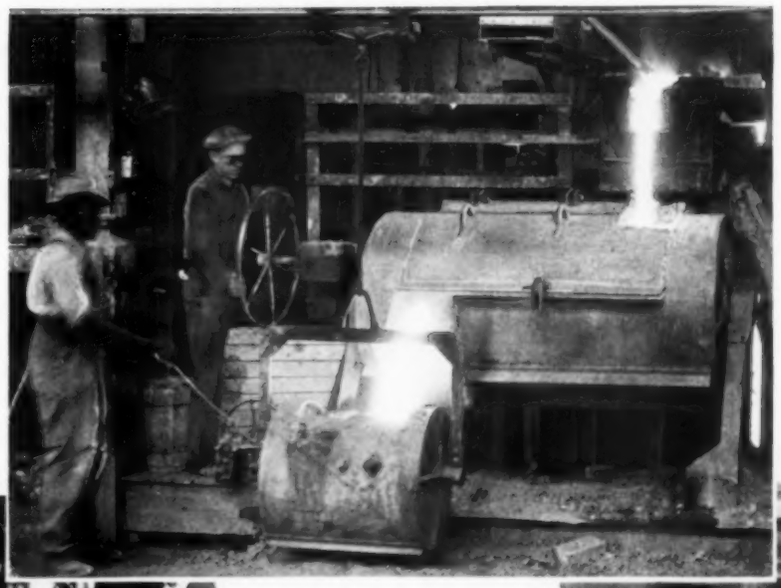
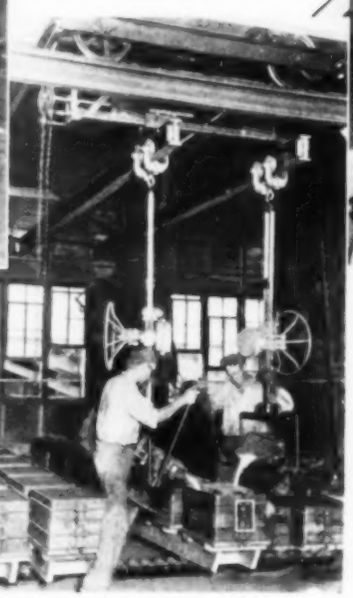


Modern 3000 lb. Mixing Ladle delivering metal into a 1000 lb. Modern Cylindrical distributing ladle in a stove foundry. Absolute uniformity of metal has resulted.

Mfgd. under USA Patents 1703231, 1816185, 2073150, 2079765, 2122032, 2100713, 2134785, others applied for.



Modern one ton Covered and Insulated Ladle above. Metal is held in this ladle 30 to 45 minutes regularly.

Modern one-man pouring devices simplify pouring of heavy floors and eliminate much hard disagreeable labor.

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MODERN EQUIPMENT COMPANY

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MODERN EQUIPMENT CO.

(*Continued from page 68*)

gram of the chapter, giving evidence of the need and desire for an active chapter in the area served. For that reason the directors look forward to a highly successful season starting in the fall.

W. A. Bachman, chairman of the entertainment committee, asked for a vote on the question of holding a picnic outing during June and the idea was so well received that plans are being made to hold the party at some nearby lake resort where golf, swimming and other sports are available.—*L. L. Andrus, secretary-treasurer.*

Ontario

THE last meeting of the Ontario chapter for the season was held on April 28 at the Carls-Rite hotel, Toronto, with Chairman Joseph Sully, Sully Brass Foundry, Ltd., presiding. The officers of the chapter for the coming year were formally elected as follows: Chairman, D. J. Macdonald, Dominion Radiator & Boiler Co., Toronto; vice chairman, D. M. Storie, Fittings, Ltd., Oshawa; secretary-treasurer, S. R. Francis, Metals & Alloys, Ltd., Toronto. The following directors were elected: Joseph Sully, Sully Brass Works, Toronto; O. W. Ellis, Ontario Research foundation, Toronto; W. R. Barnes, W. R. Barnes & Co., Hamilton; N. B. Clarke, Steel Co. of Canada, Ltd., Hamilton; C. C. MacDonald, Frederic B. Stevens of Canada, Toronto; J. J. McFadyen, Galt Malleable Iron Co., Ltd., Galt; John Thwaites, Beatty Bros., Ltd., Fergus; T. G. Beament, Fahralloy Canada, Ltd., Orillia; John Reid, Canadian Westinghouse Co., Ltd., Hamilton.

Paying his first visit to the Ontario chapter since its organization, Robert E. Kennedy, secretary of the A.F.A. presented an attractive picture of the activities of the 43rd annual convention, now a part of association history. Rapid growth of the A.F.A. family was apparent in the fact that the less than year old Ontario chapter already has three younger brother organizations.

Some fundamental principles in the production and application of alloy cast irons in the foundry were discussed by R. G. McElwee, foundry engineer, Vanadium Corp. of America, Detroit. Mr. McElwee pointed out that alloying elements may be divided into two principal groups with two subdivisions in each case. The softeners or graphitizers with deoxidizing properties are silicon, titanium, aluminum. Graphitizers without deoxidizing action include nickel, copper and cobalt. Inert hardeners are molybdenum and tungsten. Those with affinity for oxygen include manganese, vanadium, chromium and boron. Under certain conditions the latter subdivision might be softeners, but this is never true of molybdenum and tungsten.

The real science of making alloy cast irons consists in the proper combination of hardening and softening alloys to secure special results desired. For instance, by balancing chromium and manganese with silicon, it is possible to secure excellent results in the equalization of properties of cast iron so that varied sections have similar structure. Alloys provide a means for improving properties of cast irons for many purposes and at the same time materially reduce the deviation in characteristics so common to ordinary cast iron.—*S. R. Francis, secretary-treasurer.*

New England

REGULAR monthly meeting of the New England Foundrymen's association was held at the Engineers' club, Boston, May 10. The meeting was dedicated as Peddlers Nite and the speakers were all representatives of foundry supply houses who are members of the association. Francis LeBaron, E. L. LeBaron Foundry Co., Brockton, Mass., and vice president of the group presided in the absence of President Robert J. Nelson.

Wilson W. Olney, North American Refractories Co., was the first speaker and he described the manufacture of firebrick. He pointed out that modern brick is manufactured by three principal methods; hand process, machine process and the dry press process. In discussing early manufacture of brick, Mr. Olney said that considerable difficulty was encountered due to lack of plasticity of the clays available.

Russell F. Lincoln, Osborn Mfg. Co., Cleveland, described the company's inverted jolt squeeze machine and said that in his opinion this was one of the outstanding developments of modern research. He also mentioned in connection with core blowing that this process may be the forerunner of mold blowing in the future.

J. R. Cooney, George F. Pettinos Inc., described instances where synthetic sands had been developed in foundries and resulted in marked sand sale reductions for producers. His account of the saving brought about in the Saco Lowell shops was very interesting and was the basis of considerable discussion.

H. E. Beckman, Springfield Facing Co., related how the demand for supermaterials forced supply men to be continually developing higher quality materials for the trade. He described a foundry in Mexico City which he visited recently which had modern sand handling and testing equipment.

A. L. Gardner, Pangborn Corp., Hagerstown, Md., presented an interesting motion picture showing the operation of the company's cleaning equipment. He also stated that in his opinion castings washing equipment was becoming more important.

A. B. Eastwood of the Tabor Mfg. Co. spoke briefly on "Modern Abrasive Cutting" and its effect on labor saving economy of cleaning castings.

After the speakers were finished, Mr. LeBaron complimented them and said that he regretted that there was not time for representatives of all supply concerns who were members of the association to speak. It is his thought that another meeting of this type be arranged in the future with the cooperation of other supply houses. Many questions were asked in the discussion which followed the meeting.—*M. A. Hosmer, reporter.*

New Jersey

OVER 100 foundrymen heard an exceptionally interesting talk by Oliver Smalley, president, Meehanite Metal Corp. on "Engineering Properties of Cast Iron" at the meeting of the New Jersey Foundrymen's association, May 8 at the Downtown club, Newark, N. J.

Mr. Smalley said that cast iron, when properly made in accordance with recently developed practice, has the characteristics of a superior engineering material. He showed many slides of applications where cast iron has replaced other engineering materials. Superiority was shown in abrasive wear, impact wear, lubricated sliding wear, erosion, damping of vibration, quiet operation, in resistance to high temperatures and in creep strength.

The designing engineer can be sold only in his own language and most foundrymen have failed because they do not know the engineer's language. Welding engineers do, and therefore welded construction often has replaced castings when properly made cast iron would have been a better material for the job.

Cast iron has a potential tensile strength of 150,000 pounds per square inch but due to variations in the quantity and form of mechanically distributed graphite, ordinary cast iron usually runs between 17,000 and 50,000. Best classification is based on quantity and form of graphite, and on total carbon plus one-third silicon. When total carbon plus one-third silicon is between 3.3 and 4.3, tensile strength varies

(*Continued on page 74*)

A 4' x 6' Model "D" Simplicity Gyrating Shake-Out installed in connection with a Schneible "Uni-Flo" Dust Collection Hood in a large Eastern foundry.

Simplicity
FOUNDRY EQUIPMENT

This photograph illustrates how a shake-out capable of handling a ten ton flask can be installed so that dust can be collected without interfering with the overhead crane. Using Simplicity Shake-Out Units enables you to centralize your flask and casting cleaning operation at one or more fixed points, thereby permitting easy collection of the dust by hoods or panels.

The ever increasing number of Simplicity foundry installations are the best proof we can offer to support our definite assertion that positive satisfaction is assured by a Simplicity installation. This applies for a heavy duty shake-out or knock-out job, handling flasks and castings from a production line, screening foundry sands in a continuous system, or handling heap sand on the floor with a Portable Unit. We give you proper design and construction with an engineering background based on years of real experience.

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NO. F-3
IS NOW AVAILABLE

Have a Simplicity Engineer Check Your Requirements

SIMPLICITY ENGINEERING COMPANY
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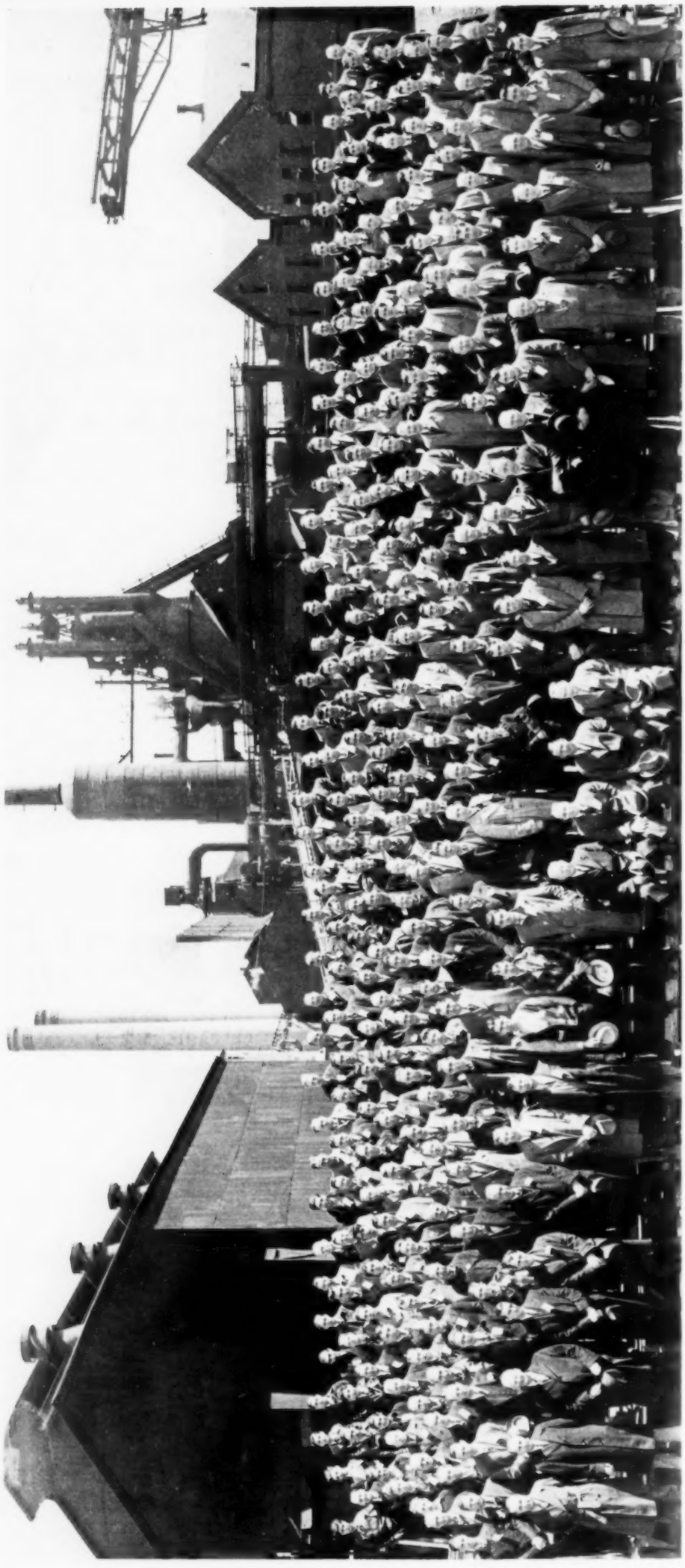


(*Continued from page* 72)

from 32,000 to 70,000 pounds per square inch. Brittleness of cast iron is due only to form and quantity of graphite. When graphite flakes are reduced so that they do not interlock, cast iron begins to become a material of truly elastic properties and toughness.—*John L. Carter, secretary.*

Chicago

OVER 125 members and guests attended the May meeting of the Chicago Chapter of the A.F.A., held at the Medinah Club, Chicago, May 8. Subject of the evening was "Unusual Uses of Castings," with reference to cast iron, malleable and steel products. E. J. Carmody, metallurgist, Charles C. Kawin Co., Chicago, discussed cast iron, pointing to products of greater strength gained by alloys and improved foundry practices. Mr. Carmody's talk, illustrated with slides, discussed the heat and corrosion-resistant, close-grained product with tensile strength of 82,000 pounds.

Malleable iron products was the subject discussed by J. H. Lansing, shop practice engineer, Malleable Founders' Society, Cleveland. He also dealt with annealing methods for pearlitic and white iron and illustrated his talk with slides of malleable iron products, ranging from automotive parts to fence posts.

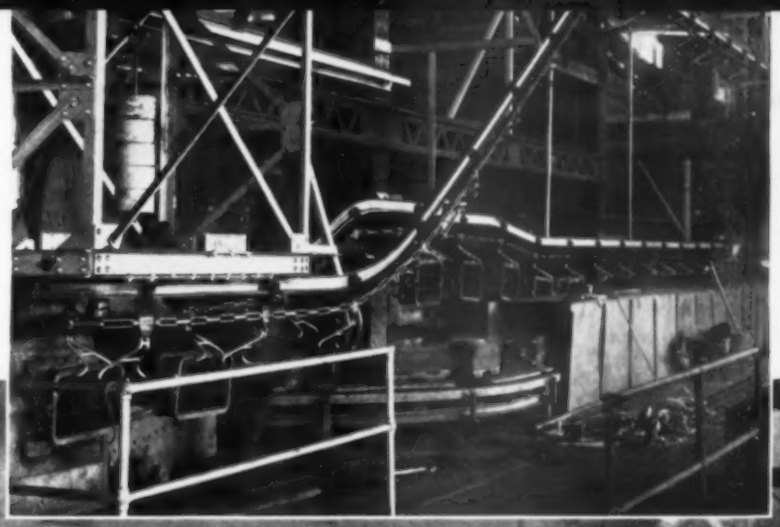
C. W. Briggs, technical engineer, Steel Founders' Society of America, Cleveland, had been scheduled as the third speaker of the evening, but illness prevented him from attending the meeting. Mr. Briggs, however, had prepared a considerable number of slides showing castings weighing as little as one pound to as much as 250 tons and ranging from small gears and machine parts to large marine structures. In Mr. Briggs' absence these slides were presented and com-

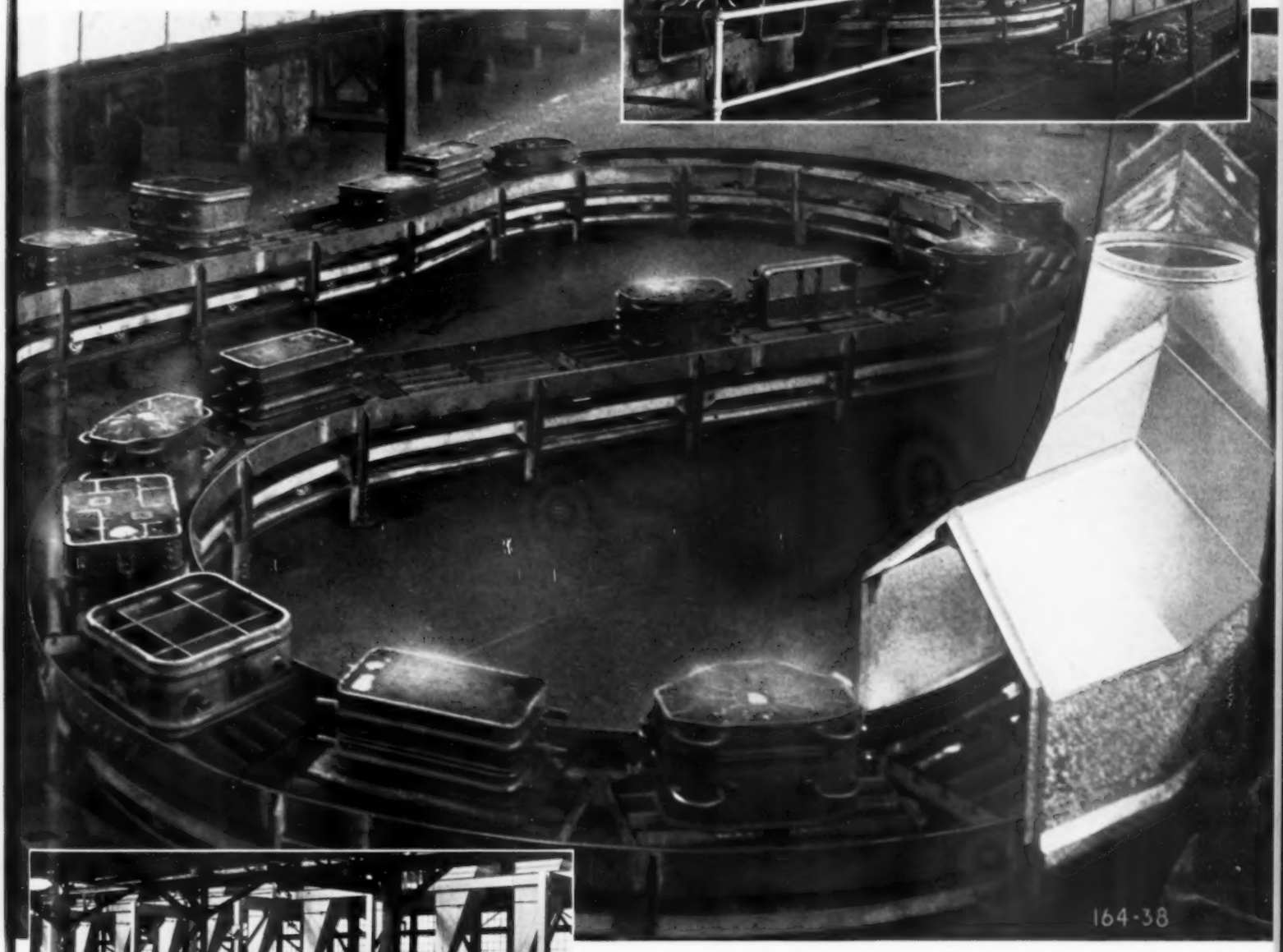
(*Continued on page* 76)

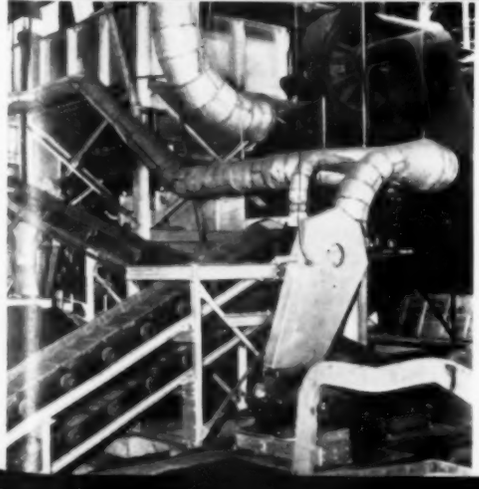
Wisconsin Steel Co. played host at its South Chicago plant on April 22 to more than 200 visitors who came under the auspices of the lecture course of the Chicago Chapter of the A.F.A. The visit was the concluding event of this year's lecture course. In parties of 15 the visitors inspected the by-product coke ovens, open hearth furnaces, blast furnaces, power house, the 21-inch continuous blooming mill, and the merchant bar mill. Seated in the illustration, left to right are L. B. Robertson, superintendent, Wisconsin Steel Co.; J. D. Burlie, Western Electric Co., and chairman of the lecture course; William E. Brewster, assistant superintendent, Wisconsin Steel Co., and Garnet P. Phillips, International Harvester Co., and a director of the Chicago chapter

Jeffrey

EQUIPMENT — ENGINEERS CAN HELP YOU CUT HANDLING COSTS







Many foundries, large or small, have been cutting their costs materially through the mechanization of their operations the Jeffrey way. Largely responsible for cost-cutting innovations in design, Jeffrey engineers are constantly giving attention to details of construction which make for lower maintenance costs. Jeffrey can show you profitable results . . has modernized many foundries for greater savings with mold conveyors, flask fillers, aerators, screens, paddle mixers, sanditioners, core crushers, elevators, conveyors, loaders and unloaders. Send for a Jeffrey foundry engineer.

FOUNDRY DIVISION

The Jeffrey Manufacturing Company

907-99 North Fourth Street, Columbus, Ohio

(*Continued from page* 74)

mented on by Bert Aamodt, secretary, National Malleable & Steel Castings Co., Chicago. An open discussion following this presentation dealt with the comparison of welded steel products and cast steel products.

The next meeting will be held June 12 at the Medinah Club with dinner at 6:30 and discussion at 8:00 P.M.—*J. F. Powell.*

Kansas City-St. Louis

NINETY foundrymen and friends from Missouri, Kansas and Oklahoma were present at the second annual extension meeting held under the auspices of the St. Louis chapter of the A. F. A. at the President hotel, Kansas City, Mo., Friday evening, April 21. Approximately 20 went to Kansas City from St. Louis, a distance of 300 miles, to participate in this movement to stimulate interest in the American Foundrymen's association and its various activities.

During the course of the evening the meeting was under the chairmanship of A. O. Nilles, Griffin Wheel Co., Kansas City. L. E. Everett, acting chairman of the St. Louis chapter, extended an invitation to those present to join the A. F. A., directing special attention to the many advantages offered through membership in the organization. Special emphasis was placed on the fraternal interest felt by the St. Louis chapter toward the Kansas City foundrymen. A cordial invitation was given to participate in the picnic of the St. Louis chapter to be held June 10. Among other points of interest directed to the group's attention was the conference to be held by the chapter in October at the Jefferson hotel in St. Louis. A special invitation was given to this group to attend.

Speaker of the evening was C. R. Culling, Carondelet Foundry Co., St. Louis. The subject of his talk was "General Foundry Practice in a Specialty Jobbing Foundry." The talk was excellently received and the stereopticon slides displayed by Mr. Culling were of decided interest to the group. Following the talk a round table discussion of about an hour's duration was held.—*J. W. Kelin, secretary.*

St. Louis

PRINCIPAL speaker of the May 11 meeting of the St. Louis District chapter of the A.F.A. was Ed King, Hill & Griffith Co., Cincinnati. His subject, "Molding Sands," was well received by the group and the discussion period which followed was very active.

Inasmuch as the meeting was designated as the annual business meeting, a complete annual report and financial statement was submitted by the secretary-treasurer. Attention was directed to the membership increase from 90 on May 1, 1938, to 107 on May 1, 1939. Incidentally, two memberships received during the evening increased the total to 109. Acting chairman, L. E. Everett then asked for the report of the membership committee which was submitted by R. Stifel. Two new members were presented, Clee Shy, Banner Iron Works, and Walter A. Zeis, Midwest Foundry Supply Co.

C. R. Culling gave a report on the apprentice training committee outlining results of the molding and pattern making contests that had been held several weeks previous. Chairman of the entertainment committee directed special attention to the picnic on June 10 to be held at Joe Davies' country club. A proposed constitutional amendment, increasing the board of directors from 6 to 12, was passed by the chapter, previous reading having been given at the April meeting.

L. J. Desparois, chairman of the nominating committee, submitted a proposed list of officers for the coming year. The committee's report was accepted and the following officers and directors were elected: L. E. Everett, Key Co., East St. Louis, Ill., chairman; W. Carter Bliss, Scullin Steel Co., St. Louis, vice chairman; J. W. Kelin, Federated Metals division, American Smelting & Refining Co., St. Louis, secretary-treasurer. Directors for 3-year term: C. H. Marken, Carondelet Foundry Co., St. Louis; L. C. Farquhar, American Steel Foundries, Granite City, Ill.; A. O. Nilles, Griffin Wheel Co., North Kansas City, Mo.; Webb L. Kammerer, Midvale Mining & Mfg. Co., St. Louis. Directors elected for two years: L. J. Filstead, John C. Kupferle Foundry Co., St. Louis, and R. K. Durkan, M. W. Warren Coke Co., St. Louis. Directors elected for one year: H. Sanders, American Foundry & Mfg. Co., St. Louis, and C. E. Rothweiler, Hickman, Williams & Co., St. Louis.—*J. W. Kelin, secretary-treasurer.*

Twin City

ANNUAL meeting of the Twin City Foundrymen's association was held May 10 at the Minneapolis Shrine club. Fifty members and guests enjoyed a delicious chicken dinner, following which the meeting was called to order by President H. H. Blosjo. The present officers and executive committee were re-elected unanimously to serve another year, and are: President, H. H. Blosjo, Minneapolis Electric Steel Castings Co., Minneapolis; vice president, Fred Kaim, Union Brass & Metal Mfg. Co., St. Paul; secretary-treasurer, O. W. Potter, University of Minnesota, Minneapolis. The executive committee includes: S. V. Wood, Minneapolis Electric Steel Castings Co., Minneapolis; Frederick Christensen, R. R. Howell & Co., Minneapolis; Jack Bryant, Northern Foundry Co., Minneapolis; E. H. Ryan, St. Paul Brass Foundry Co., St. Paul; Stuart Cameron, Valley Iron Works, St. Paul; G. L. Ashton, St. Paul Foundry Co., St. Paul; and E. C. Madson, Anderson Foundry Co., Bayport, Minn.

Entertainment for the evening was two reels of moving pictures, one presented by the Ford Motor Co. on the River Rouge plant and the second "Coast to Coast by Plane" presented by United Air Lines. A. E. Towne, district manager for the air line company, described the picture as it was shown.

This closed the most successful year in the history of the local association. Membership now numbers 25 companies operating foundries and the average attendance for the past year was 55. There is new life in the organization and the outlook for the coming year is very promising.—*O. W. Potter, secretary-treasurer.*

Apprentice Contest At Cleveland

Preliminary contest among the patternmaking apprentices of Cleveland, sponsored jointly by the Cleveland Trade school, Pattern Manufacturer's association and the Associated Industries of Cleveland, drew 19 applications from 12 companies. Winners in this contest include: First, George Gedeon, Motor Pattern Co.; Second, John Burczky, Master Pattern Co.; Third, Joe Klecka, Pattern Engineering & Mfg. Co. The young men began their careers in Cleveland Trade school under the direction of Frank C. Cech, patternmaker instructor. Selection of the patterns to go to Cincinnati for entrance in the national contest was made by five judges, A. Anderle, Motor Patterns Co.; Pat Dwyer, THE FOUNDRY; George Gedeon, Aluminum Co. of America; Ed Guttman, Standard Pattern Works; Frank Hrabak, East End Pattern Works; Walter Seebeck, Western Pattern Works.

Twenty nine boys from the trade school under the direction of James G. Goldie, who now are doing part time work in foundries throughout the city, submitted castings in the ferrous and nonferrous foundry contest. In the gray iron group first place was awarded Jerry Halek, Bowler Foundry Co.; second place

(*Concluded on page* 79)

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(*Concluded from page 76*)

to Anthony Sutowski, Forest City Foundries Co.; third place to John Dzurik, Cleveland Trade school. In the steel foundry group first and second places were awarded respectively to Joseph Berkenheur and Andrew Warcaba, Crucible Steel Castings Co. Third place was awarded John Paliwoda, West Steel Castings Co.

In the nonferrous division Stanley Burford, Wellman Bronze & Aluminum Co., was awarded first place. Second place was won by Joseph Wyban, Gluntz Brass Foundries, Inc.; and third place was awarded Joe Januszewski, Thompson Products Inc. Castings were appraised and rated by four judges, Pat Dwyer, THE FOUNDRY; F. J. Fredriksen, Westinghouse Electric & Mfg. Co.; W. C. Manwell, Fulton Foundry & Machine Co., and W. H. Shilling, Atlas Foundry Co.

Chapter Year Book

Southern California chapter of the A. F. A., Los Angeles, recently has published a most attractive yearbook giving the standing committees, company members, personal members, the program for the year and the by-laws of the Southern California chapter. The yearbook is bound in a looseleaf folder with the member's name on the cover.

J. G. Coffman is chairman of the chapter, Bert Oldfield, vice chairman, M. S. Robb, secretary, and Charles Gregg, treasurer.

Book Review

Heat Treatment of Metallurgical Products, by Albert Portevin, fabrikoid, 246 pages, 6 x 9 inches, published by the Penton Publishing Co., and supplied by THE FOUNDRY, Cleveland, for $5 postpaid, and in Europe by the Penton Publishing Co. Ltd., London.

This volume, which forms an introduction to the study of heat treatment, departs from the usual manner of presentation in that the author has made an attempt to appeal mainly to the intuitive notions and to the experimental determinations and facts resulting from observations. By so doing Professor Portevin has preferred to sacrifice somewhat the rigorous literary style in favor of simplicity and clearness.

The author has emphasized his plan in a simple manner by various supplementary chapters wherein elementary experiments are cited and laboratory study apparatus is described. These chapters constituting the description of manipulations, clarify or supplement the preceding chapter, and also show the connection between given facts and actual use.

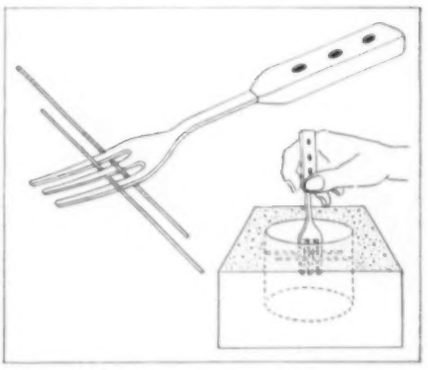
Subjects treated include transformation points of steel, preliminary treatment of steel, quenching, hardened steels, hardening capacity of steel, tempering, classification of industrial steels, annealing, malleablization of cast irons, heat treatment of light aluminum alloys, etc.

Research engineers, metallurgical students and steel plant metallurgists, as well as others engaged in metallurgical investigation and heat treatment of ferrous and nonferrous metals and alloys, will find this work of inestimable value because Professor Portevin's purpose has been to include directions to interpret and understand phenomena and to solve the difficulties which actually occur in heat treatment of various commodities.

Fork and Wires for Inside Caliper

By A. N. Waychoff

An improvised caliper for measuring the diameter of an inside opening is shown in the accompanying illustration. Two short pieces of wire are inserted as shown between the tines of an ordinary table fork. By adjusting the wires slightly the exact diameter of the opening is determined. The idea of course is not original since mechanics in various lines have used two pieces of wood, rods or wire for the same purpose, probably since the days when mechanics first began measuring. However, the table fork and the wires present an ingenious adaptation of an old practice and comes in handy when more suitable equipment is not at hand.

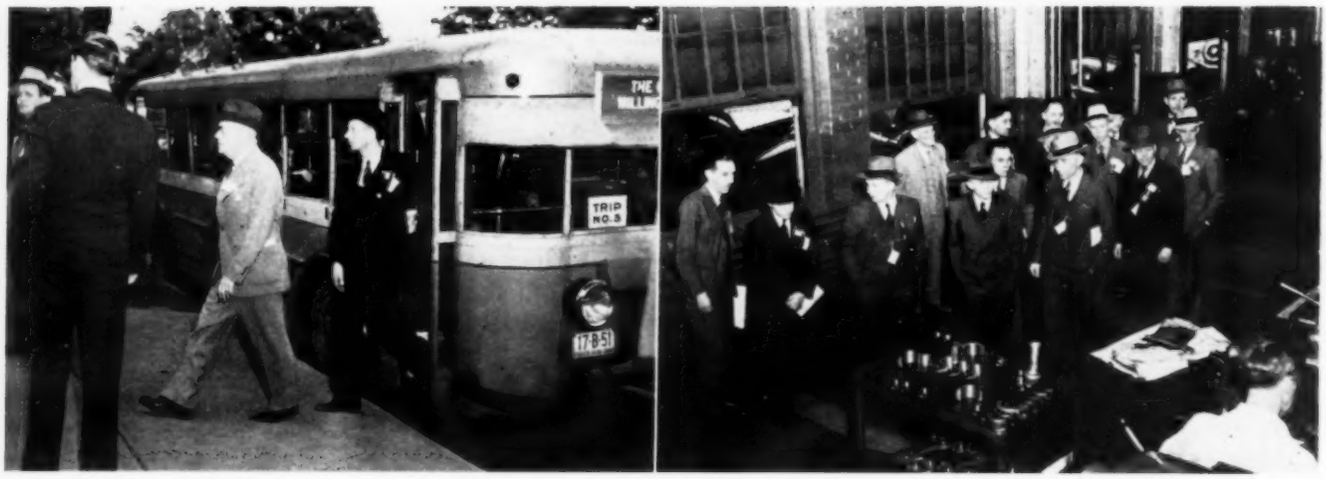


The wires readily may be adjusted in the fork tines

To Hold Forum

Fourth annual forum of the Porcelain Enamel institute will be held at Ohio State university, Columbus, O., Oct. 18 to 20, according to an announcement by Frank E. Hodek Jr., General Porcelain Enameling & Mfg. Co., and chairman of the forum committee.

Judges in action deciding merits of work submitted in Cleveland apprentice contest



Convention Attracts Attention

(*Continued from page* 29)

Foundry, Cleveland; second, Stanley Burford, Wellman Brass & Aluminum Foundry Co., Cleveland; third, Norman Knuth, Standard Brass Works, Miwaukee. *Gray iron molding:* First, Lewis W. Greenslade, Brown & Sharpe Mfg. Co., Providence, R. I.; second, Frank Kilnec, Sheboygan Foundry Co., Sheboygan, Wis.; third, Charles Maull, Semi Steel Castings Co., St. Louis. *Pattern making:* First, George Gedeon, Cleveland Trade school, Cleveland; second, John Merz, Cincinnati Milling Machine Co,. Cincinnati; third, George W. Wert, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.

Business Management Has Job

The following were judges in the respective contests: *Nonferrous*, William Greener, Powell Valve Co., Cincinnati; John Bradford, Edna Brass Mfg. Co., Cincinnati; E. L. Bunting, Lunkenheimer Co., Cincinnati; *Gray iron*, M. Brockman, Lunkenheimer Co., Cincinnati; William Rengering, Cincinnati Milling Machine Co., Cincinnati; W. C. Scott, Williamson Heater Co., Cincinnati; *Steel*, Richard Ashburn, Sawbrook Steel Castings Co., Cincinnati; Elmer Radabaugh, Lunkenheimer Co., Cincinnati; O. H. Moeller, Cincinnati Steel Castings Co., Cincinnati; *Pattern making*, Herman Meyer, Superior Pattern Co., Cincinnati; Charles Appel, Lunkenheimer Co., Cincinnati; L. Naberhaus, Cincinnati Milling Machine Co., Cincinnati.

Addresing the meeting on the subject "Business Management Has a Job," Fred H. Clausen, president, Van Brunt Mfg. Co., Horicon, Wis.; vice president, Chamber of Commerce of the United States, and for several years chairman of its federal finance committee, stated that "the job of management has been broadened and extended to include all phases of national life. It is not limited to the responsibilities we have assumed toward workers and stockholders, but includes the public and government itself."

Mr. Clausen had been selected the second speaker in a series of annual addresses sponsored by the A.F.A. board of awards, purpose being to provide the membership with discussions of public and nontechnical problems.

"Business is getting tired of the role of 'Whipping Boy' for our economic shortcomings," he declared. In 1932, with millions unemployed, the new administration assumed the role of deliverer and assumed an impotence on the part of management founded on a charge that industry had created the conditions that brought the depression.

Outlines Industrial Relations

"In employment relations," he continued, "it (the government) accepted the preamble statement of the American Federation of Labor that the relation of manager and worker is inherently one of hostility and therefore a program of collective action must be ordained to take from management the things that labor should possess.

"This position has brought industrial management into disrepute because the public generally does not understand our attitude. Intelligent managers have never questioned the right of collective bargaining. Management generally would be willing to go along with unionism if labor and government will accept a few fundamentals that should control industrial relations:

1. Relationship of employer and worker is inherently one of co-operation and not of hostility.

2. Wages paid must be related to work done, more pay for less work as a slogan is economically wrong.

3. Right to work shall not be denied any man because of membership or nonmembership in any labor organization.

4. Right to strike and leave work shall be accompanied by lawful picketing only, free from violence and intimidation.

5. Sit-down strikes are intolerable.

6. All parties to labor agreements must accept legal and moral responsibility for their acts."

Make Enactments Workable

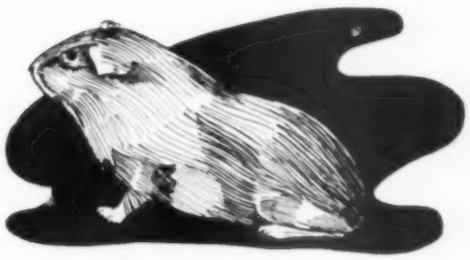
Referring to the Wagner act and wages and hours law, Mr. Clausen stated the only course is for business to use its influence for amendment and modification so as to make the enactments workable and protect the rights of workers and management alike. Commenting on unemployment compensation, he said this must justify itself as a form of dismissal wage and not as a dole or poor relief.

Devoting a considerable portion of his address to federal taxation, Mr. Clausen declared this to be the most important problem looming on the horizon of national affairs. He condemned pump priming as "defeating the very purpose for which it was contrived." The people of this nation must soon decide which way they want to go.

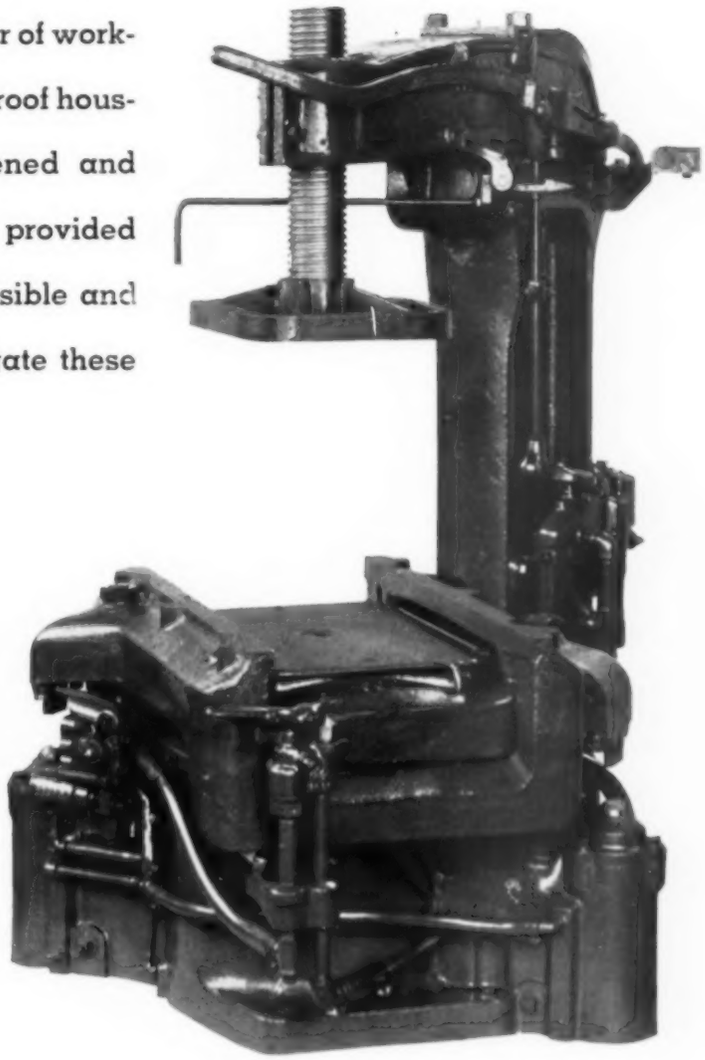
A great deal of interest was displayed in the 3-session instructional

(*Concluded on page* 82)

Why Continue to be a GUINEA PIG?



In past years, foundrymen were forced to experiment with various types of molding equipment. But why CONTINUE to be a guinea pig for unproven ideas? Select Milwaukee and Davenport Molders which have been through the mill and which have proven their merit on the toughest jobs. These machines are designed with the fewest number of working parts which are fully enclosed in dust proof housings. All pins and bushings are hardened and ground. Pressure lubricating fittings are provided through-out. Adjustments are very accessible and easy to make. It will pay you to investigate these modern, high-speed molding machines.



Write us today for complete information on all types and sizes of Milwaukee and Davenport Molding Machines. No obligation, of course.

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(*Continued from page* 80)

lecture course presented on Monday, Tuesday and Wednesday by R. M. Allen, Bloomfield, N. J., on the subject, "The Microscope in Elementary Cast Iron Metallurgy." First lecture was presented Monday night with Hyman Bornstein, Deere & Co., Moline, Ill., as chairman; the second on Tuesday afternoon with Garnet P. Phillips, International Harvester Co., Chicago, as chairman, and the third on Wednesday afternoon with H. A. Deane, Deere & Co., Moline, Ill., as chairman.

Topics discussed in the lectures included the value of the microscope to the gray iron foundryman, fundamentals of physical gray iron metallurgy, sulphur and phosphorus in gray iron, special gray irons, gray iron equilibrium diagram, and the microscope and technique of its use. Material forming the basis of Mr. Allen's discourses now are available in a book entitled, "The Microscope in Elementary Cast Iron Metallurgy," and published by the A.F.A.

Established Safety Program

Safety and hygiene was the topic of a session held Tuesday afternoon with L. C. Wilson, Reading Steel Casting division, American Chain & Cable Co., Reading, Pa., in the chair. He introduced P. E. Rentschler, Hamilton Foundry & Machine Co., Hamilton, O., who gave a detailed description of his experience in establishing a safety and hygiene program in a small foundry. He pointed out that a definite effort had been made to maintain a close personal contact with the workmen in the plant, and that the first development was from the health point of view. The safety phase then followed.

Mr. Rentschler said that the result was an interest in personal health. Interest was secured in health lectures which were arranged by his firm, safety consciousness was developed, and improved plant maintenance was provided without hardly any additional expense. Mr. Rentschler said that the development of the safety and hygiene program logically led to the arrangement of an open house to which employes' families were invited. He stated that he believed that the work was paying large dividends.

W. H. Doerfner, Saginaw Malleable division, General Motors Corp., Saginaw, Mich., then gave a brief presentation on how his firm held an open house which more than 5000 people of Saginaw attended. He said that it was studied carefully before it was carried out, and arranged from a public relations viewpoint. He stated that it should be remembered that people generally are interested in how products are made. He suggested starting a plant visitation with inviting the local dignitaries such as city officials, etc. To make it worthwhile a definite product should be taken, and all phases of its manufacture explained in detail. As a final touch the visitors should be given a souvenir of some kind to carry away with them, as it leaves a lasting impression. Both Mr. Rentschler and Mr. Doerfner stressed taking of numerous photographs which later are displayed on bulletin boards, and also given to individuals appearing in them. Officials should also be present to greet the visitors.

Equipment Necessary in Modern Foundry

PROBLEMS associated with materials handling and selection and use of foundry equipment proved an interesting subject for session Monday evening. E. W. Beach, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., served as chairman. The program provided two papers — "Molding Equipment for the Miscellaneous Production Foundry," by W. J. Jennings, foundry superintendent, John Deere Tractor Co., Waterloo, Iowa; and "Some Tests on Effectiveness of Water Blast Under High Pressure for Cleaning Castings," by Ronald Webster, Hydro-Blast Corp., Chicago.

Describing molding equipment in general and value of sand control, equipment maintenance, sandslinger units, and jolt squeeze units in detail, Mr. Jennings cautioned against over-equipping as against under-equipping in setting up a foundry on a modern production basis. "Our problem today is to make castings cheap, accurate, and of a definite engineering quality," he said. "The answer is equipment and control. Accurate castings could be made with highly skilled workmen where molding price is not the deciding factor. However, to maintain the American standard of high wages, better quality, and lower price, we must produce in quantity.

"There are perhaps a dozen large foundries which are completely mechanized and a hundred or more partially so. Due to changing economic conditions, it becomes almost imperative that our foundries are equipped better—improved from every point of view—working and atmospheric conditions, washroom, toilet and production facilities with less lost time. The foundry is becoming a manufacturing unit which operates on an 8-hour schedule," Mr. Jennings continued.

"A molding unit may cost from $5000 to $10,000 per molder. Interest and depreciation on a $10,000 investment are equivalent to a man on the payroll. This man may have no clock number, but he stands at your elbow every day, 5 days per week, 52 weeks per year. Be sure you keep him busy. For the average shop the unit should be designed to be profitable at below normal requirement, and have flexibility enough to operate 24 hours per day in high production periods."

A point emphasized repeatedly by Mr. Jennings was that the important job in the foundry is "to get sand into the molds and get the molds away from the molders." Illustrating how this is accomplished in his own foundry, he described various methods and equipment which expedite flow and eliminate hold-ups.

Summarizing tests made on the effectiveness of high-pressure water blast for cleaning castings, Mr. Webster stated that: Sand entrained in high velocity water has an appreciable abrasion action on metal;

(*Continued on page* 84)

ACID WEAR

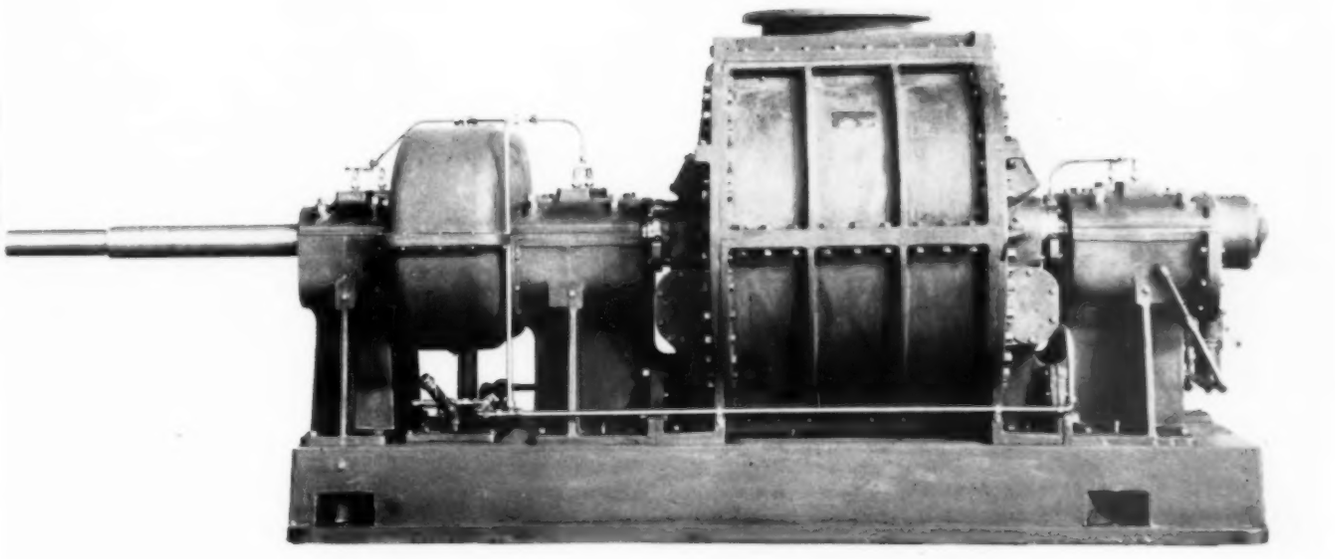
DEATH TO CASTINGS

vs

STRENGTH MACHINABILITY

GLOBE SILVERY

CORROSION RESISTANCE



HEAVY DUTY GAS PUMP—6200 cfm at 255 rpm
Made by Roots-Connersville Blower Corporation, Connersville, Ind.

Handles SO_2 Gas

ALL CASTINGS MADE FROM GLOBE SILVERY MIX

It is significant that outstanding manufacturers like Roots-Connersville Blower Corporation, whose castings meet unusual service requirements, standardize on GLOBE Silvery Pig Iron in their cupola mixes. GLOBE Silvery insures proper Graphitization which means good machinability on strong castings.

When You Think of Silvery... You Think of Globe

GLOBE IRON COMPANY
JACKSON, OHIO

(*Continued from page 82*)

effectiveness does not change significantly up to 36 inches, but that the stream becomes less concentrated at a distance; and pure water alone, even at 1200 pounds, has no significant effect.

In the water-blast method water at a pressure of 1200 pounds per square inch is discharged by a hand gun, having a replaceable 0.190-inch orifice, at a speed of 18,000 feet per minute. This high speed is necessary to give proper velocity to the sand. The ratio of water to sand by weight is 3 to 1, or 28 gallons of water to 60 to 70 pounds of sand. The sand, which is wet, is sucked into the gun and not fed by gravity—the later procedure would cause plugging.

For average cleaning work, a mixture of coarse-grain and fine-grain sand is satisfactory, asserted Mr. Webster. Coarse grain is most suitable for removing heavy, brittle scale; and fine grain for lighter, tight scale which is to be removed without pitting.

Castings can be made to dry bright by adding to the water potassium bichromate in the proportion of 1 pound to 8000 gallons. This is only a temporary rust inhibitor. It is understood that castings which are so treated and which are to be galvanized must be washed in a dilute solution of muriatic acid to remove effect of the potassium bichromate. Application of enamel, however, is understood to be unaffected by the solution.

Steel Foundrymen Stage Extensive Program

UNDER the joint chairmanship of John W. Bolton, Lunkenheimer Co., Cincinnati, and W. C. Hartman, Bethlehem Steel Co., Bethlehem, Pa., two papers were presented at the Wednesday morning steel session, one on heat and corrosion resistant castings of the chromium-nickel-iron types and the other on properties of copper bearing cast steels. The author of the first paper, J. D. Corfield, Michigan Steel Casting Co., Detroit, pointed out that the choice of materials for castings intended for use at high temperatures involves consideration of two major factors, resistance to chemical attack and physical strength. In oxidizing conditions a minimum of about 15 per cent chromium plus at least 12 per cent nickel is required while in a high sulphur atmosphere 24 per cent chromium is essential.

In selecting an alloy for castings for use in a corrosive environment at normal or moderately high temperature the safest method is to expose test pieces under actual operating conditions. Where previous experience indicates the type of alloy required, details of analysis should take into account the factor of castability and other features which render the material most adaptable to the foundry art.

Up to the present no standardized system of classifying heat and corrosion resisting alloys according to chemical analysis has been adopted. The speaker showed two tables indicating respectively typical heat resisting alloys for castings, and alloy casting association standard classification for heat and corrosion resisting alloys. These tables showed the symbols of classification, also the nickel and chromium percentages.

The paper on properties of some copper bearing steels prepared jointly by C. T. Greenidge and C. H. Lorig, Battelle Memorial institute, Columbus, O., was presented by Mr. Lorig. The paper profusely illustrated with tables and charts discussed effects of copper additions up to 2.40 per cent. The low alloy cast steels contained one or more of the following elements: Vanadium, titanium, aluminum, molybdenum, columbium, zirconium, chromium, silicon and manganese, the last two in higher than normal percentages.

According to the investigation copper contents above 0.50 per cent increase markedly the tensile and yield strengths of fully annealed, of normalized and of quenched and drawn cast steels with only a slight lowering of the ductility and resistance to impact. Several alloying combinations containing copper and one or more of the other common alloying elements are satisfactory in low-alloy, high strength cast steels. Two types were discussed in detail: Copper - manganese - titanium steels and copper-chromium steels containing either aluminum or titanium.

Concluding part of the meeting was devoted to report of committee on impact tests and to report of committee on radiography, gamma-ray radiographic standards of the United States navy for steel castings. The report was presented by N. A. Kahn, New York navy yard, New York.

Determine Carbon Content Rapidly

A wide-spread interest characterized the steel session held Wednesday afternoon under the chairmanship of John Howe Hall, consultant, Philadelphia, and the co-chairmanship of D. C. Zuege, Sivyer Steel Casting Co., Milwaukee.

H. H. Blosjo, metallurgist, Minneapolis Electric Steel Castings Co., Minneapolis, in speaking on "A Rapid Method for Determining Carbon in Plain Carbon Steels for Control Purposes" described a rugged but cheap instrument for rapidly determining the carbon in the melt of small electric furnaces. The unit compares the magnetic permeability of a bar of unknown carbon content with the magnetic permeability of a bar of known carbon content.

The instrument has proved valuable for the control of carbon in low alloy steels, where the alloy residuals are closely controlled; it is especially valuable to a foundry whose production is mainly plain carbon cast steel and whose melting equipment is rapid.

A paper entitled "Synthetic Bonded Steel Molding Sands" by C. W. Briggs, Steel Founders' Society of America, Cleveland, and R. E. Morey, Naval research laboratory, Anacostia, D. C., commanded considerable interest and wide discussion. The paper dealt with data which is characteristic of molding

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sand in general but in particular with washed silica sand, bentonite and water. The paper brought out that the necessary strength for molding sands ranged from 2 to 12 pounds per square inch and that these strengths are produced by the addition of from 2 to 10 per cent bentonite.

"High Strength Cast Steels" by G. Delbart, Denain, France, and translated by W. H. Spencer, metallurgist, Sealed Power Corp., Muskegon, Mich. was abstracted by C. E. Sims, supervising metallurgist, Battelle Memorial institute, Columbus, O. This was the official exchange paper, presented on behalf of the Association Technique de Fonderie de France.

Report on Steel Castings

The paper pointed out that the homogeneity of cast steel is evidently in direct relation with the primary structure, since the cast steel always preserves its solidification structure under a form more or less attenuated. It is known that the solidification grain of steel is refined by additions of vanadium, molybdenum, titanium and a simple addition of 0.15 per cent of vanadium decidedly improves the mechanical properties of a cast steel even after a simple anneal not preceding homogenization.

A report of the A.F.A. committee on heat treatment of steel castings was presented at the close of the session by D. C. Zuege, chairman of the committee. Data disclosed that 45 per cent of all the open-hearth foundries made 5 per cent or less alloy steel while the electric steel foundries show only 20 per cent making carbon steels almost exclusively. About 76 per cent of the open-hearth foundries indicated that they are giving 100 per cent of their castings some type of heat treatment.

In the open-hearth group 17 foundries reported that they use pit or car type furnaces exclusively. In the electric foundries 20 reported that they did not use hearth or box type furnaces while 14 used hearth type furnaces to supplement their car type equipment. Only four of the newer recirculating air-type furnaces for drawing are used in foundries reporting.

The average of 14 foundries using oil exclusively as fuel showed an average cost of $1.73 per ton, seven using gas exclusively had a gas cost of $2.13 per ton while four foundries using electricity averaged $6.03 per ton for castings treated. Out of 60 foundries, 27 are still controlling all temperatures manually through guidance by indicating or recording pyrometers while 33 foundries use automatic temperature control on at least some of their units.

The most popular quenching medium is water, 19 foundries reporting to this effect. About one-third of the foundries reported that on alloy steels especially if they are of the air-hardening type or are intricate shaped castings, a preheating treatment is given the castings before cleaning.

Six papers covering miscellaneous methods of melting were presented at the symposium of steel melting practice, Thursday morning. T. N. Armstrong, International Nickel Co., New York, served as chairman, and John Howe Hall as co-chairman.

Converter Coming Back

F. B. Skeates, foundry superintendent, Link-Belt Co., Chicago, in speaking on "Converter Method of Steel Making", told how side-blown converters came into disrepute during the World war because of high melting costs and high sulphur content and how the process of desulphurizing returned it to favor.

He suggested that the manganese in the metal from the cupola should not be too high, inasmuch as a high percentage of that element gives a wet, sloppy blow and tends to corrode the lining of the vessel. He also stressed the importance of holding the converter to size and having the tuyeres at the proper height from the bottom. Another important point advanced by the speaker is that the receiving ladle at the cupola and recarburizing ladle should be held to size by using a form for lining, or by weighing the metal going into the converter.

A paper on "Induction Furnace Practice in the Steel Foundry" by G. F. Landgraf, Lebanon Steel Foundry, Lebanon, Pa., discussed the typical furnace, losses, metal temperature, melting practice and furnace performance. The speaker mentioned five advantages of the induction furnace in the foundry as including flexibility as to the types of alloys that can be produced in successive orders, low melting losses, accuracy of analysis control, ease of temperature control, and a high degree of uniformity of the product.

A paper on "Steel Foundry Acid Open-Hearth Practice", was presented by W. C. Harris, metallurgist, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa. One of the points brought out by the speaker was that at his plant the pig iron is charged first. He explained that when the iron is thus charged and spread evenly over the bottom of the hearth, the pig iron attacks the bottom to a lesser degree than the heavier scrap; and that the pig iron having a lower melting point than the remainder of the scrap melts first to form a pool of metal which is covered by a slag high in manganese oxide and silicon dioxide.

In conclusion the speaker presented the following operating data: Fuel consumption ranges from 27 to 30 gallons of oil per ton of metal, the furnace roof usually runs from 800 to 1000 heats before requiring attention, the sidewalls are repaired after 300 to 350 heats, and the checkers and slag pockets are good for 550 to 600 heats.

Basic Open Hearth

J. W. Porter, American Steel Foundries, East Chicago, Ind., presented a paper on "Steel Foundry Basic Open-Hearth Practice" which was supplemented by various cross sectional views and photographs of that type furnace as well as tables appertaining to its operation. He recommended two sources of draft—a fan to force the air into the furnace and a stack to draw the air out of the furnace.

In making alloy additions, the speaker favored adding 15 per cent ferrosilicon to the bath 10 minutes before tapping the heat. A charge of 80 per cent manganese is added to the ladle through a chute, the amount varying in accordance with the residual manganese in the bath. For adjusting the silicon content to the required amount, 50 per cent ferrosilicon in ½-inch lumps is added through a chute over the furnace runner.

"Basic Electric Practice for Steel Castings," a paper presented by C. W. Briggs, technical adviser, Steel Founders' Society of America, Cleveland, outlined the methods employed in making basic electric steel by the arc-type furnace. The speaker directed attention to a modification of the double slag process wherein aluminum is used in place of carbon to obtain a reducing slag. This type of slag, he explained, finds its greatest application in stainless steel or other alloys where it is desired to maintain the carbon content in the metal at a low figure. The method has equal application to carbon steels and low alloy steels.

Lime should be mixed with the aluminum, the speaker asserted, so that it may be spread more evenly over the bath and to prevent the slag from becoming too fluid. Analyses of the metal have shown that there is no aluminum pickup. The author's paper contains a large amount of data on electric steel melting that should be in the possession of every maker of steel castings.

Of the some 265 foundries in this country, which in 1937 were engaged in the manufacture of steel castings, 175 used the electric melting process for part or, in most cases, for the total of their production. This fact was brought out by Werner Finster, metallurgist, Reading Steel Casting Division, American Chain & Cable Co., Reading, Pa. who spoke on "Acid Electric Furnace Practice."

The majority of the arc furnaces for steel foundry use are acid lined, he stated. When charging 5 tons per heat his average on five linings and roofs was 900 tons per roof and lining; when 4-ton heats were charged the life of the roof was increased to 1000 tons per roof and for the lining to 1200 tons. The speaker presented interesting data on the selection of raw materials, melting practice, slag practice, silicon reduction, and special deoxidizers.

Closing feature of the sessions on steel casting was the roundtable luncheon conference held on Thursday morning under the direction of A. H. Jameson, Malleable Iron Fittings Co., Branford, Conn., chairman, and T. N. Armstrong, International Nickel Co., New York, co-chairman. Topics of the meeting were deoxidizers, and reduction of silicon from slag. Discussion leaders for the first subject were C. E. Sims, Battelle Memorial institute, Columbus, O., and A. P. Gagnebin, International Nickel Co., Bayonne, N. J. Discussion of reduction of silicon from slag was led by D. C. Zuege, Sivyer Steel Casting Co., Milwaukee, and H. H. Blosjo, Minneapolis Electric Steel Casting Co., Minneapolis.

Many Check Construction Of Patterns

FUNDAMENTAL principles and methods of patternmaking, as practiced at the plant of the Caterpillar Tractor Co., Peoria, Ill., were described by J. E. Kolb of that organization at one of the concluding sessions Thursday presided over by Vaughan Reid, City Pattern Works, Detroit. To illustrate various phases of the presentation the speaker had on display, two complete sets of patternmakers tools, one for metal and the other for wood working, similar to those given graduating apprentices at his plant, typical patterns and coreboxes, actual cores and castings. The wood working tools are valued at $147 and the metal working tools at $119. The more expensive tools, micrometers, etc., are issued for use by the usual tool check system.

Touching on the volume of materials consumed in the Caterpillar pattern shop for the past year the speaker listed 55,413 feet northern cork pine, 26,060 feet mahogany, 56,797 pounds reclaimed aluminum, 7,085 pounds pure aluminum ingot and 174,761 pounds gray iron. In addition a number of patterns for steel, malleable iron, brass and aluminum were purchased on the outside.

Instead of the old practice of laying a blueprint before a patternmaker and telling him to make a pattern, the blueprints go through the hands of several pattern engineers. After the various features have been decided upon, detailed drawings are made showing core prints, parting lines, location in flask etc. A time and material estimate is made out and the entire report submitted to the superintendent for approval. It is further checked by the foundry production manager and by the manager of the foundry.

Selection of Wood

Illustrating the manner in which wood is selected for patterns, the speaker showed (a) drawing of cross section of a log used for pattern lumber (b) board from the center of the log (c) board cut from section without regard to growth rings (d) board cut to counteract warpage (e) method of glueing strips together (f) board from definite position cut and glued ready

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for pattern use. Patternmakers differ to some extent on the amount of moisture acceptable after kiln drying. In the speaker's opinion from 5 to 7 per cent represents a fair and acceptable amount. The cost of the wood is the lowest item in the cost of a pattern. Number of man hours accounts for the major part of the expense. While on the subject of materials the speaker also referred to aluminum, magnesium, iron, brass, chrome plating, behavior of patterns on molding machines, and shellac. He claimed that the average layman may feel astonished when he learns that certain patterns cost as much as a complete five or six room home equipped with every modern convenience.

Through suitable slides he showed in detail the methods employed in making a typical matchplate for an air cleaner pipe. Matchplates usually are 7/16-inch thick with a ⅜-inch upset. The paper concluded with detailed description of methods employed in making pattern equipment for transmission cases, two cylinder diesel starting engine made entirely in dry sand cores, carrier rollers made in permanent molds with dry sand cores on the inside.

Nonferrous Practices Are Featured

TWO extremely interesting papers were presented at the opening nonferrous session held Monday morning. William M. Ball Jr., Edna Brass Mfg. Co., Cincinnati, acted as chairman, and Carl O. Thieme, H. Kramer & Co., Chicago, was vice chairman. First paper was by D. Frank O'Connor, Walworth Co., Boston, and was concerned with production of bronze castings for pressure work. He stated that quality castings were dependent upon good melting practice, pouring practice which will result in uniform solidification, proper maintenance of all equipment, and proper control supervision.

Castings on Display

Mr. O'Connor described in some detail practices employed in his plant to insure adherance to the principles mentioned. He displayed a large variety of castings to illustrate the type of work produced in his foundry. These castings also depicted the soundness of practices employed. In discussion of the paper T. E. Kihlgren, International Nickel Co., Bayonne, N. J., wrote that while he agreed with the author in general, he wished to point out that charcoal used as a cover for molten metal should be preheated so that it is free from moisture to prevent introduction of hydrogen from the water. Bronze should be melted under moderately oxidizing conditions, as mentioned by Mr. O'Connor, and that in some cases where reducing conditions may occur, it may be advisable to employ 1 or 2 per cent copper oxide before addition of white metals.

G. M. Thrasher, R. Lavin & Sons Inc., Elmira, N. Y., wrote that he did not agree with the author's statement of 40 degrees Fahr. temperature drop from first to last mold on a 150-pound ladle. He checked a 180-pound ladle at one time and found that total drop ranged from 135 to 150 degrees or about 35 degrees per minute. Mr. Ball asked if use of small gates led to incipient shrinkage which was answered by the statement that pressure tests indicated solid castings. W. G. Brayer, Bausch & Lomb Optical Co., Rochester, N. Y. asked whether Mr. O'Connor had tried broken glass as a cover. Mr. O'Connor said he had not but imagined that it should be a good protection. In reply to a question on whether there was any relation between sprue and runner size, Mr. O'Connor stated that there was no definite relation, but that the sprue must have a larger area than the runner.

Suggests Use of Hot Air

Second paper presented was by G. K. Eggleston, Detroit Lubricator Co., Detroit, on "Crucible Melting." From data gathered during experimental work and observation he said that a general knowledge of combustion chemistry is beneficial for efficient furnace operation; that flame and furnace temperature should be kept high as possible; insulation is desirable; preheating air and gas will improve efficiency of melting, and with such a combination, metal losses may be reduced.

Written discussion of the paper by G. M. Thrasher pointed out that trouble in crucible melting may be caused by using too small a furnace for a given pot size, that the pot may be located too low in the furnace, and that combustion space around the lower part of the furnace may not be sufficient. R. W. Parsons, Ohio Brass Co., Mansfield, O., asked if the flame temperatures mentioned were theoretical, and if use of excess air would not reduce them in practice. The author replied that was the case, but redesign of furnaces and burners might give a closer approach to the theoretical.

Dr. G. H. Clamer, Ajax Metal Co., Philadelphia, called attention to the thermal conductivity of the metal being melted. He said that metal in a solid piece conducted heat much more readily than if the same quantity was in the form of turnings or borings, and that fact must be considered. He then asked if any one had had any experience with a new refractory which he believes is composed of ferrosilicon bonded with phosphoric acid.

Harold J. Roast, Canadian Bronze Co. Ltd., Montreal, stated that both theory and practice must be considered since little advance can be made with either alone. In reply to a question on what improvements are needed in furnaces, Mr. Eggleston stated he thought there should be a redesign of the combustion chamber, redesign of burner, and preheating of air. Since air slowly picks up heat, he believes that air preheaters probably would have to be quite large.

Effect on Physical Properties

Second nonferrous session was under the direction of Harold J. Roast, Canadian Bronze Co. Ltd., Montreal, chairman, and W. J. Laird, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., cochairman. First paper presented was by H. B. Gardner and C. M. Saeger Jr., bureau of standards, Washington, on "Effects of Aluminum and Antimony on the Physical Properties of Red Cast Brass (85-5-5-5) which was abstracted by Mr. Gardner. Results of an investigation indicate that aluminum from 0.005 to 0.10 per cent had a deleterious effect especially in the higher ranges and was particularly noticeable in the ductility and resistance to pressure. Antimony from 0.10 to 0.25 per cent had only a nominal effect except to increase running quality.

Written discussion by G. M. Thrasher, R. Lavin & Sons Inc., Elmira, N. Y., stated he believes a more complete analysis than given by the authors is desirable since small variations in composition has considerable effect on properties. He also feels that close temperature control of the laboratory would dif-

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The Kirk & Blum exhibit at the 1938 A.F.A. Show, Cleveland. In the rear is shown a portion of the Kirk & Blum piping erected for one of the major exhibitors who had a large amount of equipment in operation. It is significant that this Kirk & Blum Piping System was preferred to all local and other installations.

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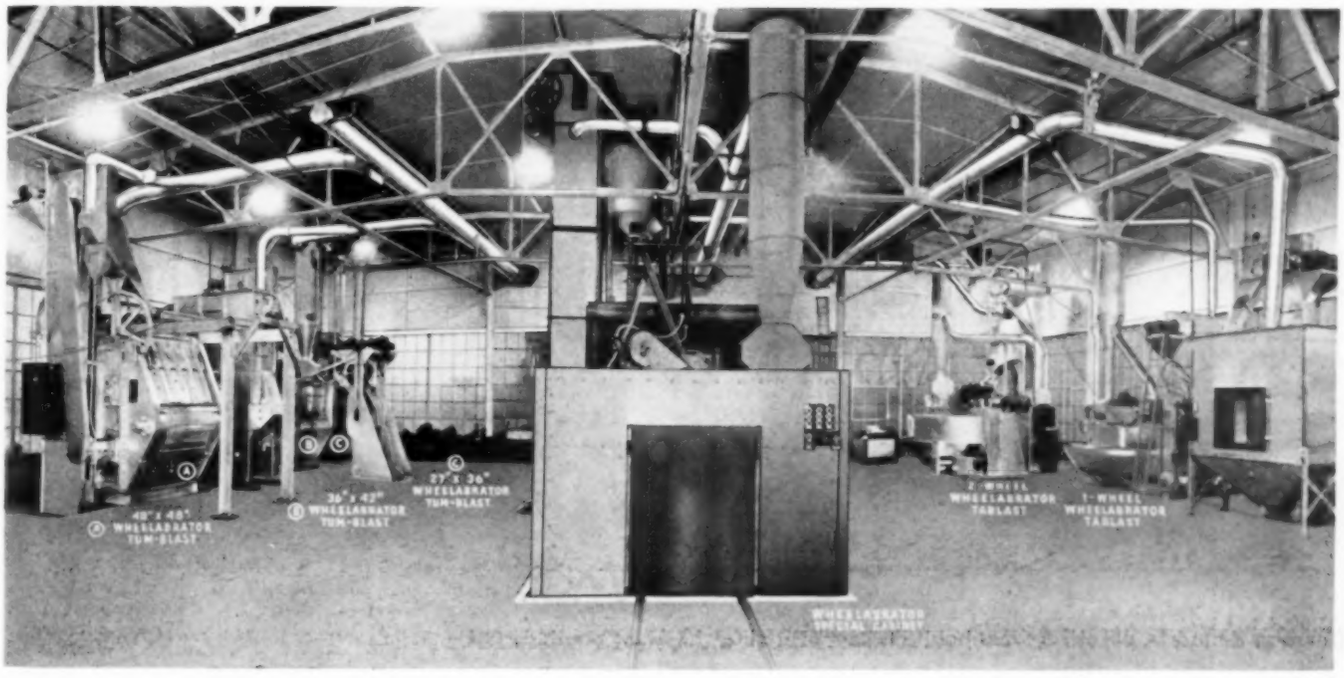
(Below) Kirk & Blum Installation in the Demonstration Room of The American Foundry Equipment Company, Mishawaka, Ind.



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fer from that in production, and possibly may effect the results. Mr. Gardner said variations in composition could be allowed for, and that observation and opinions from others indicated temperature variations would not affect results appreciably. Others discussing the paper included M. G. Corson, New York, R. W. Parsons, Ohio Brass Co., Mansfield, O. W. M. Ball Jr., Edna Brass Mfg. Co., Cincinnati, and H. J. Jameson, Detroit Testing Laboratory, Detroit. Discussion of the dye method of determining aluminum content indicated that separation of elements first by the mercury cathode method led to concordant results by which aluminum content to 0.001 per cent could be detected.

Has High Conductivity

"High Conductivity Copper Castings," was the subject of the second paper which in absence of the author, A. B. Kinzel, Union Carbide & Carbon Research Laboratories, New York, was presented by C. O. Burgess of the same firm. The particular type of alloy contains about 0.80 per cent chromium and 0.08 per cent silicon which can be heat treated at high temperature and drawn at 500 degrees Cent. to obtain high hardness and tensile strength with excellent electrical and thermal conductivity.

W. J. Laird mentioned some experiences with such alloys and said he believes that where moderate properties only are desired, a binary alloy would serve as well as a ternary alloy. He stated that it is advisable to deoxidize the copper with some other agent than silicon previous to its addition to prevent formation of a flocculent material which is hard to remove. M. G. Corson suggests use of calcium and sodium fluorides as a flux and covering agent and pointed out that in his original work he had considerable difficulty in obtaining a perfectly clean metal since he could not use a protective cover in the particular type of crucible employed.

At the close of the second paper the annual business meeting of the nonferrous division was held. Harold J. Roast, chairman, announced appointment of the nominating committee which includes Sam Tour, Lucius Pitkin Inc., New York, chairman, E. J. Jennings, Canadian Bronze Co. Ltd., Montreal; J. W. Kelin, Federated Metals division, American Smelting & Refining Co., St. Louis; G. K. Eggleston, Detroit Lubricator Co., Detroit, and M. J. Brooks.

Third technical session on nonferrous foundry practice was held Tuesday morning with H. M. St. John, Crane Co., Chicago, as chairman, and William Romanoff, H. Kramer & Co., Chicago, as co-chairman. M. G. Corson, New York, presented the first paper which discussed metallurgical science and the nonferrous foundry. The speaker indicated the former has been of little value to the foundryman. He concluded that the ideal foundry is one run with so thorough a knowledge of the fundamentals and so efficiently that no testing of any kind becomes necessary.

In discussing the paper Dr. G. H. Clamer, said that he believes the author should include in his final statement "run by ideal humans and ideal raw materials." He also believes that a needed survey is one which will list all the factors affecting production of castings. L. W. Kempf, Aluminum Co. of America, Cleveland, said that Mr. Corson's paper dealt with generalities in the main which was important, but that exceptions were still more important since they meant the difference between profit and loss.

Increases the Ductility

He pointed out for example that addition of more than 0.5 per cent iron to an 8 per cent copper-aluminum alloy provides higher ductility and freedom from cracks. As the author mentioned chromium and titanium should be held at a minimum, but that is done easily. G. K. Eggleston said that addition of lead to yellow brass did little in the way of increasing machinability. H. M. St. John pointed out that in setting up standard foundry procedures it is necessary to take frequent tests, but when the methods are established, many tests are eliminated.

"Influence of Pouring Ladles on Quality of Red Brass, was discussed in a paper by R. W. Parsons. The author described a gassy condition developed in molten metal from use of ladles which were green. As soon as the ladles had been heated by molten metal the trouble disappeared. The difficulty was attributed to moisture chemically combined in the lining material. G. M. Thrasher said he had encountered trouble with a new lining in an electric furnace, but not with ladles. He asked if deoxidation before pouring made any difference, and the reply was in the negative. He also said that improper arrangement of oil-fired ladle preheaters permitted carbon deposit on the upper portion of the ladle.

C. V. Nass, Fairbanks-Morse Co., Beloit, Wis., inquired if perforated ladle shells had been tried, and the author stated that they had without effect. Carl O. Thieme asked whether black spots or bubbles appeared on the metal such as are claimed to be caused by silicon. Mr. Parsons said that they did appear, but that they were zinc oxide. G. K. Eggleston said that in his plant a special ladle heater was used which heated the ladles to a temperature hotter than the metal. Others discussing the paper included R. H. Stone, Vesuvius Crucible Co., Swissvale, Pa.; D. F. O'Connor; W. M. Ball Jr., and Dr. G. H. Clamer.

Following the Tuesday morning session, a round table luncheon conference was held under the direction of J. W. Kelin, Federated Metals division, American Smelting & Refining Co., St. Louis, at which numerous foundry problems were threshed out.

On Tuesday evening members of the nonferrous division and their ladies held their first annual dinner which was well attended. W. B. Stout, Stout Engineering Laboratories, Dearborn, Mich., gave an extremely interesting address on "The Romance of Aviation."

Job Analysis and Costs Are Given Attention

IN SPEAKING on "Practical Approach to Job Analysis" Tuesday evening under the chairmanship of Frank Wartglow, American Steel Foundries, East Chicago, Ind., and cochairmanship of H. C. Robson, Continental Roll & Steel Foundry Co., East Chicago, Ind., C. J. Stegemerten, superintendent, time study and methods department, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., pointed out that the systematic approach to job analysis frequently is conducive to improvements. He cautioned that analytical work continues in more or less detail throughout the entire study.

Analysis work is conducted successfully when a peculiar mental attitude is developed. There is a natural tendency to take pride in the familiarity in a subject. He cited a job which was improved to such an extent by detailed motion

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study that the time of operation was reduced to 1/6 of the time required under the original method. He directed attention to the fact that the best method of doing an operation from a labor economy standpoint is reached only when the labor required has been reduced to zero. Until then, he stated, further improvement always is possible.

Improvement often is afforded by suggestions, the speaker stated. He warned however that the true worth of each suggestion should be evaluated carefully before it is offered. The quickest way to prove the merit of any suggestion is to obtain estimates of the cost of adopting it and the total yearly savings it may be expected to effect. When the suggestor has convinced himself of the value of his idea, he should present it to the one who is in a position to adopt it.

Three reels of motion pictures were presented to show how motion study of various operations in the Westinghouse plants had improved operations.

An interested group attended the meeting on foundry costs which was held Wednesday afternoon. R. L. Lee, Liberty Foundry Co., Wauwatosa, Wis., was chairman, and he presented the committee reports on melting costs and molding costs which related to the procedures employed in gray iron, nonferrous, steel and malleable foundries. These reports are the first prepared by the committee, and at a later time others on the remaining departments of the various branches of the foundry industry will be made available.

Consider Annealing of Malleable Iron

ACTIVITIES of the malleable division consisted of two technical sessions and a dinner conference, all at the Netherland Plaza hotel. The first session was chairmaned by James H. Lansing, shop practice engineer, Malleable Founders' society, Cleveland. Two papers were presented: "White Iron for Malleablizing," contributed by J. O. Klein, Texas Foundries Inc., Lufkin, Tex.; and "Shearing of Malleable Iron Gates," by S. D. Martin, Saginaw Malleable Iron division, General Motors Corp., Saginaw, Mich.

In the absence of Mr. Klein, his paper was read by Leon J. Wise, manager of research and development, Chicago Malleable Castings Co., Chicago. According to Mr. Klein, white iron for the average run of malleable castings has the following approximate analysis: Carbon 2.20-2.40, silicon, 1.00-1.10, manganese 0.35-0.45, sulphur 0.08-0.14, and phosphorus 0.15-0.18 per cent. Sulphur must be in balance with manganese to prevent tears and misruns; phosphorus should not exceed 0.18 per cent else an annealed casting may show a white instead of normal black fracture.

Melting of white iron by the duplexing process using the cupola and air furnace, was recommended by Mr. Klein because of its economy over the air furnace method. In his opinion, the following mixture of raw materials gives best results: Malleable pig iron, 15-16 per cent; steel scrap, 16-18; malleable scrap, 16-18; and sprue, 45-50. The duplexing process is not only rapid, but well adapted to batch or continuous pouring. By watching furnace combustion, a heat can be held many hours by adding small amounts of petroleum coke at regular intervals. Experience of the author is that coke added every 40 minutes will hold carbon within reasonable limits.

Discussing this paper, Dr. H. A. Schwartz, manager of research, National Malleable & Steel Castings Co., Cleveland, regretted that Mr. Klein had not given more factual evidence to support his contentions and asserted there might be some question as to the effect on annealing characteristics when iron is held for several hours, rather than being poured immediately. He asked: "Does carbon content remain the same when the iron is held?"

Carl F. Joseph, metallurgist, Saginaw Malleable Iron division, General Motors Corp., Saginaw, Mich., commented that Mr. Klein said little about the properties of malleable after annealing—one important consideration being machinability. Mr. Joseph emphasized that rusty steel added to the molten metal produces mottling due to iron oxide. Clean steel does not produce that effect. Holding the iron will reduce mottling, but holding is not possible in many cases. Another speaker contributed the opinion that malleable made by the duplexing process is no harder to anneal.

Shearing of gates on malleable iron castings is becoming increasingly popular, stated Mr. Martin in his paper. This method is rapid, clean and economical, and removes metal six times faster than grinding.

First operation, said Mr. Martin, is to snub off excess metal in a sprue cutter press before shearing is undertaken. Equipment required for shearing is a shear machine, shear die, and shear knives. The shear die is bolted on the table of the machine, while the knife is secured to the ram; the die holds and locates the casting so that the gate is in the path of the knife. Anvils and blades are made of tool steel.

In discussion, Mr. Martin stated that dies are not as expensive as might be believed; a gate is completely removed so as to require no further finishing; shearing can be performed before or after castings are cleaned; as many as 15,000 gates can be sheared before blades need regrinding; shearing does not develop heat to cause hardening or cracks; and shearing is economical on runs as small as 5000 to 10,000 castings providing a shear machine is available.

Dr. Enrique Touceda, consulting engineer, Albany, N. Y., pointed out that Mr. Martin's paper was a most practical one and the type the malleable industry is seeking. He said further that removing gates by shearing would guarantee that customers do not receive hard castings.

Intimate problems and current

practices in the malleable industry were discussed at the malleable roundtable dinner meeting on Monday evening. About 60 attended that session which was presided over by Lester N. Shannon, vice president, Stockham Pipe Fittings Co., Birmingham, Ala., and P. C. DeBruyne, Moline Malleable Iron Co., St. Charles, Ill. A considerable portion of the time was devoted to discussion of synthetic molding sands and humidity control of blast for cupolas.

Second session devoted to malleable iron, held on Tuesday morning, featured presentation of three papers: "Atmosphere Control in Malleablizing," by John A. Dow, engineer, Holcroft & Co., Detroit; "Hydrogen in Solid White Cast Iron," by Dr. H. A. Schwartz, manager of research, and G. M. Guiler, research chemist, National Malleable & Steel Castings Co., Cleveland; and "Nitrogen in Malleable Iron," by E. J. Ash, assistant professor, University of Michigan, Ann Arbor, Mich. Carl F. Joseph presided and R. Schneidewind, assistant professor of metallurgy, University of Michigan, Ann Arbor, Mich., was co-chairman.

Three Types of Gas

Purpose of atmosphere control in the malleablizing or annealing process, according to Mr. Dow, is to prevent scaling of the castings during the heating and cooling cycle, therefore, the gas employed must have nonscaling characteristics. The gas is selected according to its effect upon the carbon in the iron. Production malleable after annealing ordinarily has an outer decarburized layer ranging from 0.010 to 0.015-inch thick and a layer of approximately the same thickness of pearlite which is partially decomposed into ferrite.

Three general types of gases are available for the furnace atmosphere: The bright annealing type which is cracked gas and is slightly decarburizing; neutral type which is the first type passed through charcoal to make it nondecarburizing; and the carburizing type. These three types of gases were employed in annealing malleable test specimens, but no conclusive results were obtained except that the annealing was slowed up somewhat.

Consequently, explained Mr. Dow, new tests were undertaken. One surface of each specimen was machined, and the others left in the as-cast condition. Curiously, more uniform annealing was obtained beneath the machined surface; the pearlite layer was thicker beneath the unmachined surfaces. In applying gas atmosphere, the furnace must be thoroughly gas tight.

In discussion, C. C. Lawson, Wagner Malleable Iron Co., Decatur, Ill., said his company had found atmosphere control advantageous and economical, annealing cost having been reduced one-third. Hyman Bornstein, Deere & Co., Moline, Ill., stated his experience indicated that advantages can be derived from atmosphere control and that gas composition can vary over a fairly wide range. E. G. deCoriolis, research director, Surface Combustion Corp., Toledo, O., substantiated the statement that the atmosphere itself is not of tremendous importance, but its first essential is that it be nonscaling.

Chairman Joseph volunteered that a furnace in his plant utilizes 2800 cubic feet of gas for an anneal of which 400 feet is used in generating the atmosphere. He felt, however, that the nature of the atmosphere is important, perhaps on account of water vapor content. More trouble is experienced with the atmosphere in summer when the air is moist than in the winter when it is dry. Dr. Schwartz pointed out that decarburization may be caused by something other than oxidation. No one was able to offer an explanation as to why more uniform annealing was obtained beneath a machined surface. However, this point was not important since castings in production are invariably annealed in the as-cast condition.

Measure Hydrogen Content

A method for determination of hydrogen in solid white cast iron by direct combustion in oxygen was described by Dr. Schwartz in his paper. It was shown that hydrogen content may range from about 0.0002 to 0.0015 per cent and that melting under hydrogen or the presence of rust in the charge increases hydrogen content and that hydrogen escapes rather rapidly from iron at 1475 degrees Fahr. Atomic hydrogen deposited electrolytically on the surface of white iron is absorbed and raises the hydrogen content to about that absorbed by molten iron from hydrogen gas. This hydrogen is expelled promptly on heating. Dr. Schwartz made no attempt to study effect of hydrogen on any property of the solvent iron.

Prof. Ash presented his brief paper on nitrogen in malleable simply for the sake of useful information it might contain; he made no effort to deduce conclusions.

Refractory Materials for Steel and Iron

TWO papers and extensive discussion presented at the refractories session on Tuesday evening contributed much information which should prove helpful in selection and use of refractory materials for foundry equipment. R. E. Wilke, foundry metallurgist, John Deere Tractor Co., Waterloo, Iowa, presented one paper on "Plastic Cupola Patching;" and A. V. Leun, refractory engineer, Bethlehem Steel Co., Bethlehem, Pa., the other on "Refractories Used in the Steel Foundry." E. J. Carmody, C. C. Kawin Co., Chicago, and A. H. Dierker, Ohio State university, Columbus, O., were chairman and co-chairman, respectively.

Mr. Wilke's paper described the method used successfully since 1928 by the plant with which he is associated for patching the melting zone of cupolas. A stiff mixture of fireclay, sharp sand and water is utilized in place of the conventional brick or block, resulting in economies in both refractory and labor.

After slag and coke are chipped out, the patching mud is applied by hand, starting at the tuyeres and

(*Concluded on page* 98)

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(*Concluded from page* 96)

working upward. When possible, the cupola is patched the day previous to use to allow the mud to dry properly. A white Illinois silica sand and an Illinois fireclay, both having a high fusion point are employed to make up the patching material. Sand is approximately 50 mesh and fireclay 10 to 12 mesh. Some type of pug mill is recommended for mixing, hand mixing not giving satisfactory results.

After the mud has been prepared, it may be used at once, Mr. Wilke said, as no benefit is derived in allowing it to set. It may be applied up to a thickness of 5 inches and adheres best when the chipped surface is rough. If the surface is too hot, it must be cooled by water spray.

One ton of the patching mixture having a ratio of 60 parts of sand and 40 parts of clay with labor for mixing, costs about $4. A cupola completely patched will require from 2500 to 3000 pounds at a cost of $5 to $6. It was revealed by the speaker that a complete record of all sand and fireclay for patching, and all block, brick, etc., for spouts, patching and relining used over a period during which over 66,000 tons of iron were melted, showed a refractory cost of $12.72 per 100 tons of melt.

A REPORT of the interesting sessions on core and molding sand problems, gray iron casting properties, shop courses on cupola operations, apprentice training, and castability of ferrous and nonferrous metals and alloys held during the convention week in Cincinnati will be presented in the July issue of The Foundry

Time required for preparing a cupola for the next heat was cited by the author as follows: Chip out slag and coke—1 man—20 to 40 minutes; patch melting zone—2 men—45 minutes; mud well and fill cracks—1 man—20 minutes; and put in slag hole—1 man—30 minutes.

Answering a question, Mr. Wilke said the cupola charge contained 10 per cent steel scrap and that the iron had a total carbon of 3.25 per cent. Some discussion centered around whether it is more economical to mix the mud in a pug mill or in a muller. The author had no experience with the latter, but one speaker insisted that the muller is cheaper.

In his paper dealing with refractories used in the steel foundry, Mr. Leun stated that in the design and construction of a furnace the main objective is low cost per ton of product. This is directly dependent upon life obtained from the furnace during the campaign since the preceding rebuild. To obtain the maximum life necessitates proper choice and installation of the refractories.

The speaker dealt specifically and in detail with refractories for open-hearth and electric furnaces for melting and refining, bung type and car-bottom type furnaces for annealing and strain relieving, and ladle linings. Discussion, although extended, was confined to direct questions and answers.

Attach Alloy Mixer to Cupola Spout

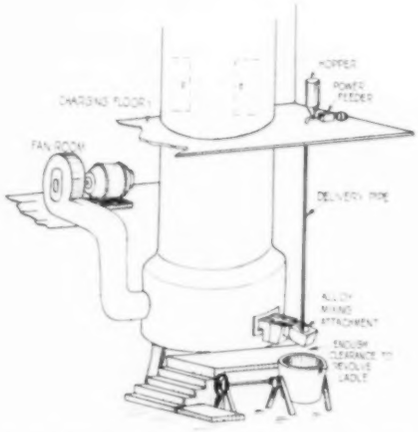
By T. C. HAMLIN
Superintendent
U. S. Radiator Corp., Edwardsville, Ill.

GRAY iron foundries in which alloy additions are made in the cupola spout, mixing, bull or hand ladles are more or less handicapped due to the close supervision necessary to secure a fair recovery of the alloy or alloys added in this manner. Spout, mixing, bull or hand ladle additions also present problems other than obtaining fair recovery. One of the greatest objections is the accumulation of undesirable impurities on the metal which must be removed.

Many foundries have overcome the objectionable features, but there are still many foundries using alloys that do not get even 50 per cent recoveries. Alloys are economical when full recovery is possible. Where certain alloys are added at the spout, mixing or other ladle, an accumulation of slag and impurities immediately rises to the surface. Unless this material is removed some of it may enter the mold with consequent rejection of the casting. Full recovery of the alloy seldom is secured. Analysis in many instances shows that less than 50 per cent recovery is secured.

Recently a method has been developed for overcoming the foregoing difficulties. Actual experience over a considerable period in a prominent Midwest gray iron foundry has demonstrated the value of the method. Spout attachment and method of adding the alloy or alloys are shown in the accompanying illustration. With this alloy mixing chamber properly designed more than 98 per cent of all pulverized or granulated alloys can be absorbed and taken into solution before the molten metal reaches the mixing, bull or hand ladle.

The mixing chamber constructed of 1-inch cast iron plates is lined with silica firestone. The curve shape on the inside to secure the desired result is formed with a high grade fireclay mixture. Irrespective of the method employed in taking iron from the cupola, the chamber can be attached and will function in a satisfactory manner. Method of installation depends on the manner in which the cupola is tapped. The device must be constructed to obtain a swirling action in the metal and the consequent formation of a vortex into which the alloy is fed. Where the chamber is formed to create this swirling action and where the tap hole is of proper size to create the vortex, the alloy fed into the stream will be taken into solution before the metal enters the ladle.



A mixing chamber is attached to the end of the spout where the alloy in powdered form falls through a pipe into the whirling metal

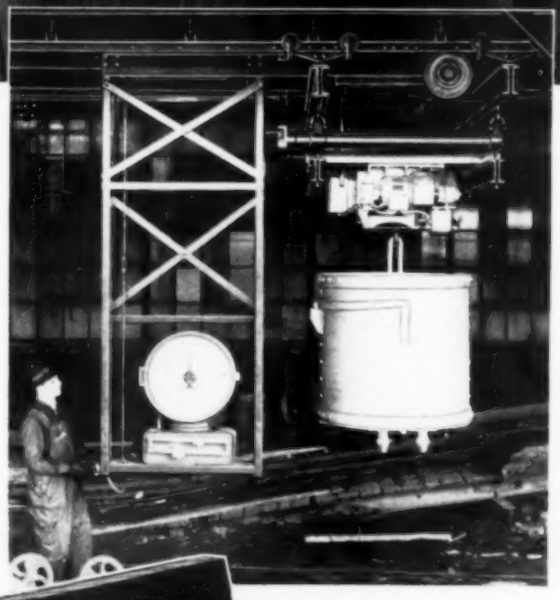
From the hopper on the charging floor the alloy is fed by gravity into the power feeder calibrated to feed a predetermined amount of alloy per hour. From the power feeder the alloy drops through delivery pipe into the alloy mixing attachment. Amount of alloy is computed by determining the tons of iron melted per hour and the number of pounds of alloy desired per ton of iron melted. The power feeder is a screw type driven through a speed reducer by a small motor. Installation shown in the illustration is in a plant melting from 75 to 140 tons per heat. Efficiency of the unit is greater than anticipated and the cost is negligible.

Mechanical *Cupola Charging*

ABOVE—Traveling scale carrier delivers accurate charge to cupola at half the former cost.

CENTER—Cupola charger lowers bottom-dump bucket to deposit material in uniform layers.

LOWER—Traveling crane type carrier assures accurate weight and careful handling of charge.



Scientific foundry practice demands control of all materials in the charge. And profits are determined by the cost of handling these materials. Both can be obtained today by mechanical charging.

With scale units controlling the weight of materials on the carrier, half the handling labor can be turned to more productive use. Buckets arrive at the charger in faster intervals for careful lowering and uniform changing to insure equal distribution of heat.

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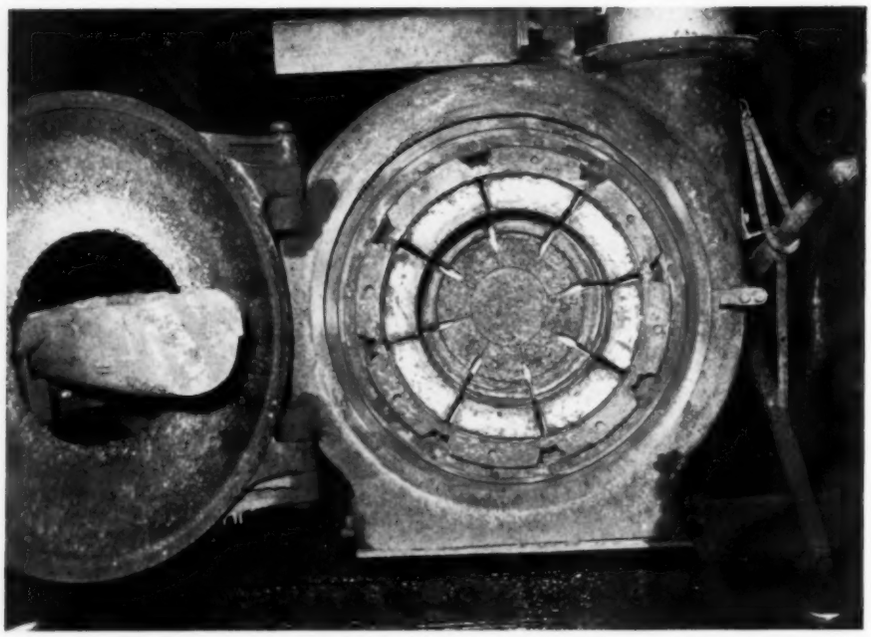


Fig. 11—Closeup of spinner, with door open showing collet-type alloy iron chuck, actuated hydraulically, which holds the steel band while molten iron is being spun in it

Fuse Lining To Shell

(*Continued from page* 33)

per cent and chromium 0.20 per cent. Some carbon additions are made in the electric furnace, and infrequently some silicon.

The electric furnace is located adjacent to two 22-foot turntable units, each provided with 18 spinners, as the centrifugal casting units are termed. Each spinner embodies a collet-type chuck of alloy iron with steel backing, on a horizontal spindle driven by a 7½-horsepower motor. Heavy cast iron doors, hinged at the side, cover each chuck and by suitable cams are arranged to open and close at the proper point on each cycle of the turntable to permit loading a steel drum and unloading the spun drum. The turntable makes one cycle every 3 minutes, and only five men are required to handle all operations on each table—two for filling runner boxes with iron, one for loading drums, one for unloading drums and one for cleaning chucks and runner boxes.

Runner boxes are attached to the doors of the spinner units and are set to hold exactly the proper amount of iron required in the drum, held within 0.1-pound. Operators with small ladles take iron from the electric furnace, pour it into the runner boxes, any excess draining into overflow pots attached to each runner box. As soon as the runner box has been filled, cams lock the doors on the spinners and tip the contents of the runner box into the chuck, which at this instant has just started to spin. Speed of rotation is approximately 900 revolutions per minute, or a peripheral speed of 3400 feet per minute.

After the table has traveled the distance of about two units, another set of cams opens the doors of the spinners so that the chucks will not become overheated. At this point the power is automatically shut off the spinners and they are allowed to drift until the table rotates the distance of about three more machines when the spinners are braked to a stop. An operator removes the drum with its cast inner surface and hangs it in an overhead chain conveyor which travels through a hooded cooling chamber and then back and forth across the roof of the building, eventually descending to the cleaning department after traversing a total of 2000 feet.

Meanwhile an operator cleans out the chuck from which the hot drum was removed, cleans out the runner box and coats it with plumbage preparatory to the next charge. These boxes are of refractory material pressed to shape and usually will last for about one full day's production. This means about 160 fillings, since normal production speed is one revolution of the table every 3 minutes. This rate also means that the two ladle men on each turntable must fill a runner box every 10 seconds, since there are 18 spinners on the table.

Fig. 5 is a closeup of an operator removing a spun drum from the chuck and gives a good idea of the construction of spinner, door, chuck and runner box. Fig. 9 is another closeup of the spinner and chuck. Notice the construction of the spinner housing, with vent pipe at the right. The spinner spindle is provided with a number of vanes which travel inside this housing and serve to air cool the device, supplanting a former water cooling system. Notice also the chuck is made in eight segments which are closed and released automatically and hydraulically.

Fig. 2 shows a general view of the complete turntable, operator in the foreground cleaning the runner box. Attention is called to the ring of gas pipe with burners about 10 feet above the floor. This is a preheating device which, before the table is started, is lowered to the level of the spinners and burners directed into the 18 chucks to preheat them.

These chucks must be maintained dimensionally with utmost care during regular production. Chucks are constantly checked for size but only removed when the circumference

(*Concluded on page* 102)

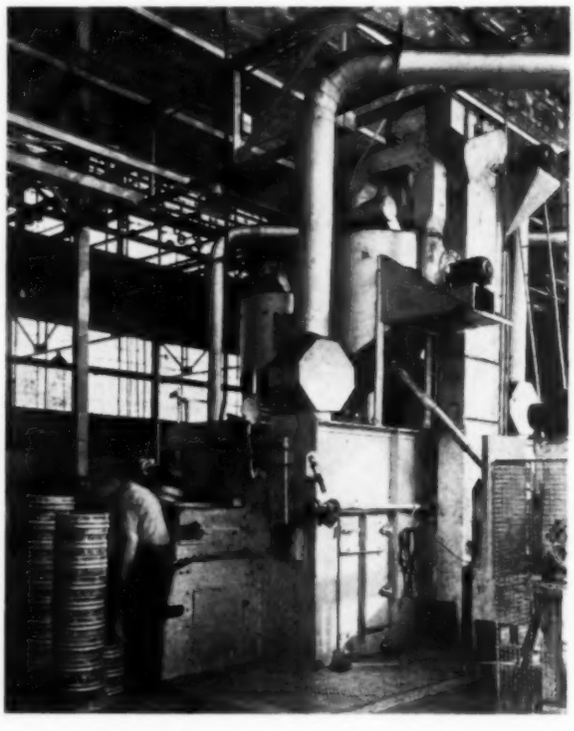
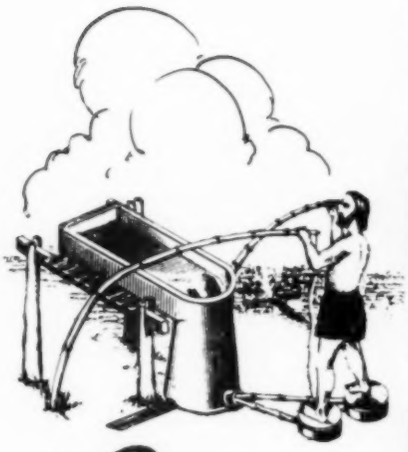
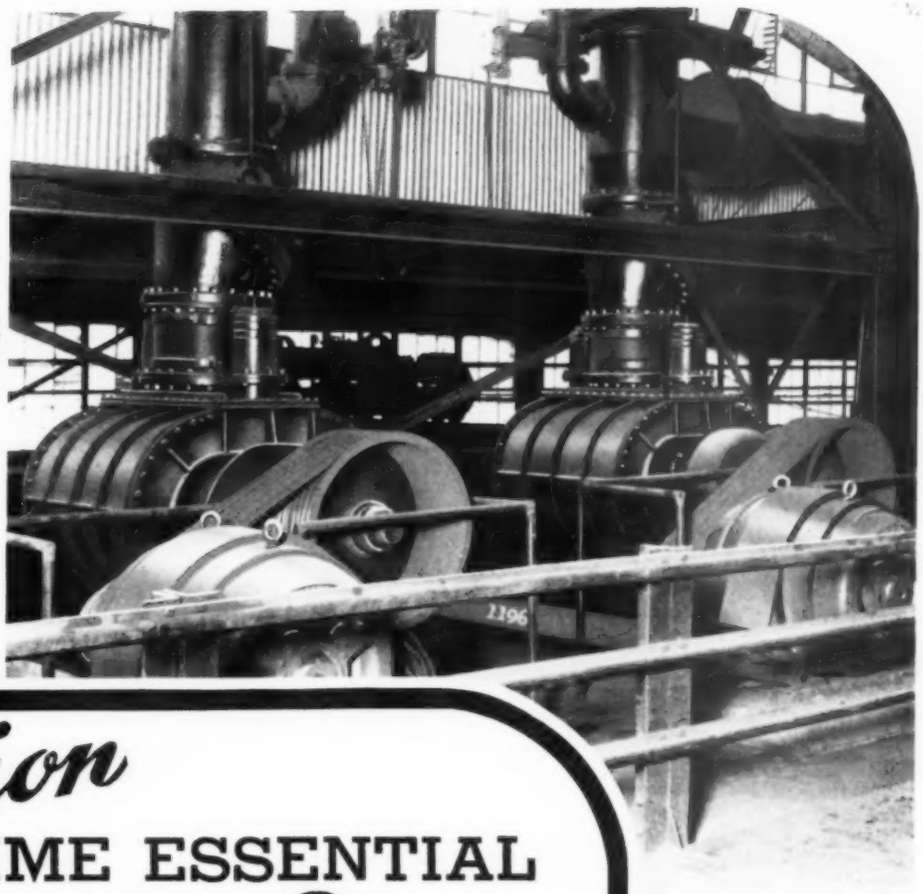


Fig. 12—Drums finally are cleaned on this Wheelabrator equipment which scours inside and outside surfaces of about 700 drums per hour





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(*Concluded from page* 100)

gages differently than is permitted by allowable tolerances. It is quite simple to remove and replace a chuck, and ordinarily can be done without losing more than one cast in the chuck, the work being done while the table rotates.

A complete cycle of casts also is weighed periodically, and, as mentioned before, if any drum exceeds the allowable limits of 0.1-pound suitable adjustment must be made to the runner box to correct the deficiency or excess in iron.

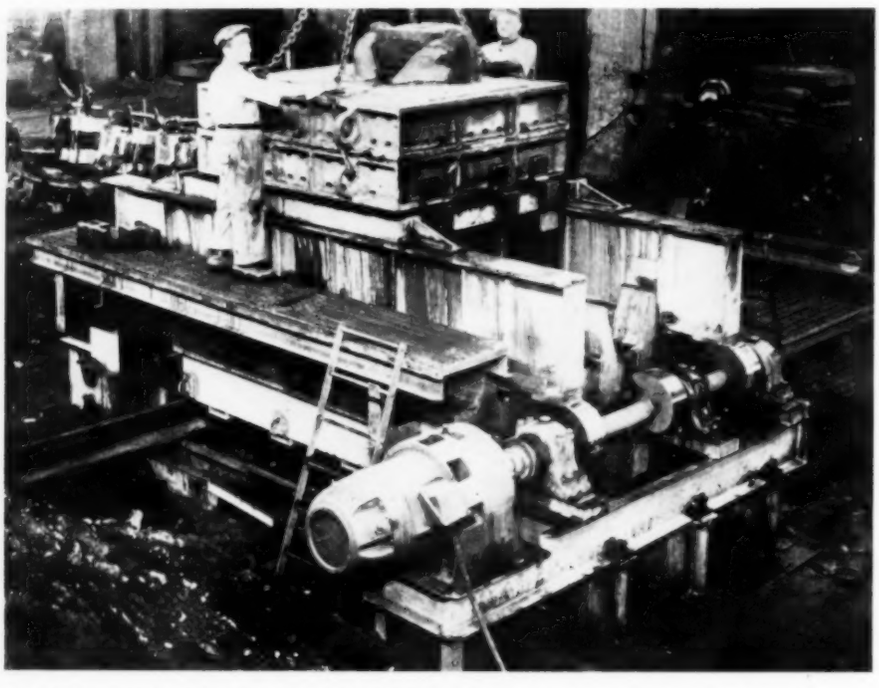
Another essential in this process is a 100 per cent fusion between the cast iron and the steel band. To insure this, special precautions are taken with the steel bands before they are chucked. First they are rolled through an inclined preheating oven which raises the temperature to 400 degrees Fahr. As the bands roll out of this oven a spray gun is swung into position and the inner surface sprayed with borax and soda ash flux, as shown in Fig. 3. An operator then transfers the fluxed bands to a seven-compartment gravity chute which carries them to the charging end of a gas-fired preheating furnace through which they travel in a double line. Preheating temperature ranges from 1200-1700 degrees Fahr., depending upon the size of the bands being produced. Exit from the preheating oven is sealed and as the bands are required in the spinners, a door is tripped and a drum quickly lifted out and placed in the spinner chuck. Fig. 4 shows the preheating oven, with an operator starting a drum into the charging end. This is a muffle-type furnace, with gas burners firing both over and under the muffle. Alloy steel rails are placed on the sides and bottom of the muffle and the shells ride along them vertically.

After traversing the 2000-foot cooling conveyor the drums are carried through automatic shotblast cleaning equipment which is provided with two adjacent rubber belts, one traveling at a higher speed than the other. By this means, when the drums are placed flat, half on one belt and half on the other, they are rotated as they pass through the shotblast, thus exposing all surfaces to the action of the abrasive. One of these cleaning machines, three of which are operated, will handle 5000-6000 double drums per 8 hours.

Incidentally, a duplicate of the electric furnace and turntable line just described is installed, primarily for production on larger size drums where the quantities made are not so large. The electric furnace is rated at 1000 pounds cold melt capacity; the two turntable units comprise 18 and 12 spinners, respectively.

Special attention has been paid to the comfort of operators working on these turntable units. Pits covered with steel grating house ventilator fans which direct a constant stream of outside air over operators working on the turntables. The building itself is practically all glass along both sides, and extends high enough to provide ample ventilation above as well as to house the stretch of cooling conveyor which travels back and forth near the roof, with wire mesh guards completely covering the space below them.

Final operations on the drum before drilling and finish machining include a light squaring up operation in a press, cutting apart on a stub lathe with right angle fixture by means of which one drum can be chucked while another is being cut. One man handles two of these machines, production averaging 60 per hour per machine. Stellite-tipped cutting tools are used. Next the cut drums are given an initial set by compressing, then are bored out on a lathe removing 3/32-inch of stock from the inner surface, and finally expanded to finish size. The boring operation, with tantalum carbide tools, is run at 280 surface feet per minute and tools give 600 pieces between grinds. Rockwell C. hardness of the cast surface ranges from 89 to 98, with 94 considered ideal.



A 20,000-pound mold is raised and dropped 83 times per minute to shake sand from the casting

Install Heavy Duty Jolting Machine

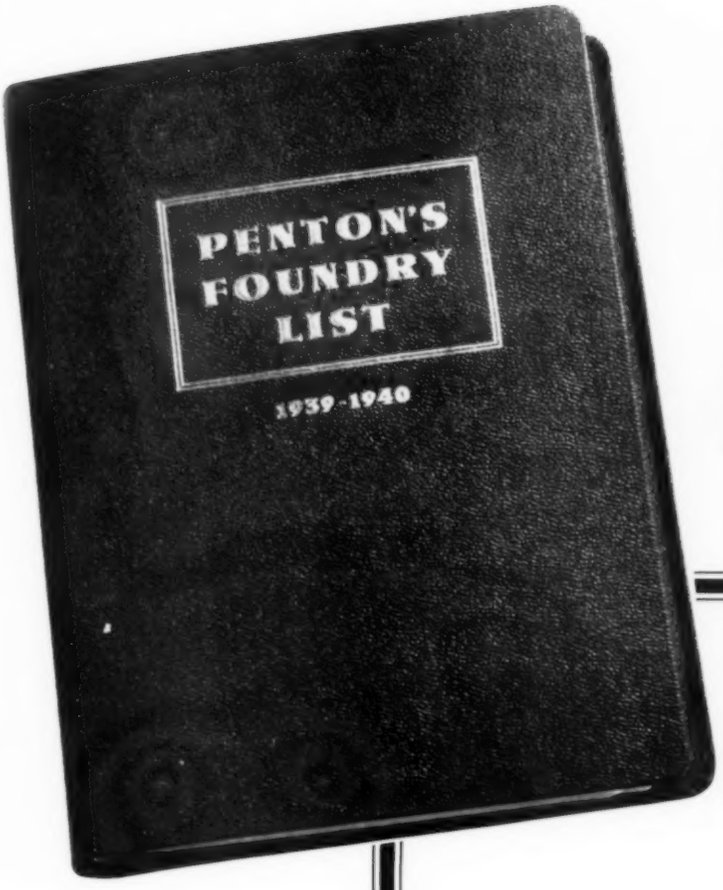
Speedily and economically separating the sand from castings in large molds, a new machine in the Everett, Mass., steel foundry of the General Electric Co., and shown in the illustration, lower left, raises and drops a 20,000-pound mold 83 times per minute. The sand falls through a grating and is collected in boxes under the machine, but the installation of a conveyor and ventilated housing is in contemplation.

6000-pound steel casting absorbs the blow of the falling mold and the entire machine is mounted in heavy structural steel frames resting on a large concrete slab foundation. The machine is powered by a 20-horsepower gear motor rotating a heavy shaft. Three cams on the shaft lift and drop one end of the shakeout beams. The beams are 24-inch I-beam sections with ⅛ x 1-inch plates welded to both flanges and web stiffeners every 2 feet. The equipment was designed by the company's maintenance and engineering department in cooperation with the foundry organization.

Book Review

How To Buy, Sell and Burn Coal, by Thomas A. Marsh, published by the author and supplied by THE FOUNDRY, Cleveland, for $1.00.

This volume is written for guidance and assistance of anyone technically or nontechnically trained who is concerned with fuel distribution and utilization. The text is the result of actual and varied fuel burning and fuel selection experiences. The author treats on selection of coal for commercial use, how to cut fuel bills, how to stop smoke, how to increase efficiency.



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Nonferrous Alloys Available

(*Continued from page* 39)

percentage of nickel addition to the composition. Since these alloys are high in copper, they are easily gassed if melted in the wrong atmosphere. To melt them in the presence of underburnt gases is almost sure to produce gassed castings which are full of bubbles with a marked concentration of the lead at the bottom of the mold where it has settled through the passages produced by the rising bubbles of gas.

It will be noted that two of these compositions, namely 1*JJ* and 1*LL*, indicate the presence of some zinc; the first, 4 per cent, the latter 1 per cent. These two compositions are known as zinc deoxidized materials and are found quite commonly in the trade, although most of the high lead alloys usually are made without zinc, unless they have been produced from scrap. Composition 1*JJ* is used regularly for cast journal bearings and these castings usually are made from ingot metal, produced from scrap in accordance with the A.S.T.M. specifications for ingot B30-36 (No. 19).

Composition 1*KK* is a straight copper-tin-lead alloy, which originally was started with the ratio of 2 of lead to 1 of tin, remainder copper. To cut the costs and meet competition, the tin has been reduced gradually to the present figure and is accepted now more or less universally. This composition is used likewise for bearings, but for high speed and light duty work more particularly. This composition is covered by A.S.T.M. specification B66-36T and by the S.A.E. specification No. 67.

Composition 1*LL* is known commonly as the 20 per cent lead, high lead bronze. The percentage of tin in this 20 per cent lead bronze varies from 4 to 6 per cent, the remainder copper, except that in this instance there is 1 per cent of zinc present and phosphorus is indicated as 0.05 per cent maximum and nickel as 0.50 per cent maximum. In other words, both phosphorus and nickel are permissible but are not demanded. However, it is presumed that since only 1 per cent of zinc is required, the composition has been deoxidized with phosphorus.

Zinc and Phosphorus Not Needed

Thus, some phosphorus must be permitted if it is to be subjected to the rigid chemical analysis of exacting inspection requirements. However, there are those who do not believe that both zinc and phosphorus should be present in the same alloy if the best results are to be obtained. With 0.5 per cent nickel permissible, there should be no difficulty in obtaining good suspension of the lead, and with up to 6 per cent of tin there should be a sufficient percentage of the copper delta constituent present to make a good bearing alloy. With 20 per cent lead to act as a semilubricant, the antifrictional qualities are up to all that could be expected of that type of alloy if it has been well manufactured, and the control of impurity values has been observed carefully.

Composition 1*LL* is used regularly in many types of small bearings where accurate machining at high speed is an important factor and where lubrication is intermittent at times and where the loads are not severe. This composition in the ingot form is covered by A.S.T.M. specification B30-36 (No. 20). This ingot of course is made from scrap but regularly is available from reputable ingot metal manufacturers and will be found to make a very satisfactory series of castings for the light duty work previously described.

Composition 1*MM* is essentially a bearing alloy since it has 9 per cent of tin and 70 per cent of copper, remainder lead, thus insuring a satisfactory proportion of the hard bearing crystal of the copper-tin delta to carry the load and at the same time having ample lead to meet the demands of those who believe in the value of lead as a lubricant and to produce a satisfactory amount of conformability for bearings and other machinery parts where conformability is a factor as well as bearing value.

Suitable for Light Loads

Composition 1*NN* is a high lead copper tin bronze containing an increase in the lead over the previously described alloy, which gives it an increase in conformability as indicated by the difference in the brinell hardness. Of course, the brinell hardness also is affected by the reduction in the tin content (9 per cent to 4 per cent). It will be seen from this that composition 1*NN* being softer and having much less copper-tin bearing crystals, is a composition that cannot be interchanged with the previous composition, but has a field in bearings that is its own, namely, where high conformability is desired and where loads are light and speeds are high.

Composition 1*OO* is a high lead bronze, in which the tin is almost negligible. There may be those who would hardly expect to call this alloy a bronze as it is almost the combination of copper and lead alone. However, that composition is used quite commonly as are also compositions in which an increase in the lead is present, even up to the composition of 50 per cent copper, 50 per cent lead, which is used for metallic packing rings and such service. Composition 1*OO* also is used for these packing rings and other light duty bearings and needs to be manufactured carefully if sound castings, free from segregation of lead, are to be assured.

In general, the entire series of compositions are affected definitely by the presence of certain impurities. For example, some types of copper available in the market contain small fractions of a percentage of arsenic. The presence of even a small percentage of arsenic

(*Concluded on page* 106)

Table VI

Physical Properties of Nonferrous Alloys

No.	Tensile strength	Yield point	Elongation per cent	Brinell hardness	pounds per cu. in.
1AA	25-31,000	12,000	8-13	45-55	0.322
1BB	30-35,000	19-20,000	15-18	50-55	0.321
1CC	26,800	19,600	11	.....	0.326
1DD	25,000		8		0.326
1EE	25-35,000	15,000	10-17	45-50	0.329
1FF	29-35,000	18-20,000	10-15	60-65	0.329
1GG	28-35,000	20-22,000	13.5	63	0.324
1HH	28-32,000	18-19,000	4- 8	70	0.324
1II	25,000	16,000	18	55	0.328
1JJ	25-30,000		10-15	47-55	0.329
1KK	17-25,000	8-12,000	7-10	45-50	0.340
1LL	22-27,000		10-16	42-47	0.329
1MM	31,000	15,100	15	60	0.343
1NN	21,000	10,100	16	42	0.345
1OO	6- 6,600		3		0.348
1PP	55-75,000	22-30,000	22-30	115-121*	0.279
1QQ	73-86,000	20-33,000	22-29	102-106	0.275
1RR	65-100,000	47-50,000	4-20	130-190	0.272
1SS	70-80,000	32-37,000	18-22	137-139*	0.275
1TT	80-95,000	36-44,000	3- 5	285-302*	0.263
1UU	45-58,000	22-28,000	18-30	90-100	0.320
1VV	76,400	45,000	8.7	160	0.268
1WW	54,000	15,000	70	86-93	0.308

* 3000 kg. load.

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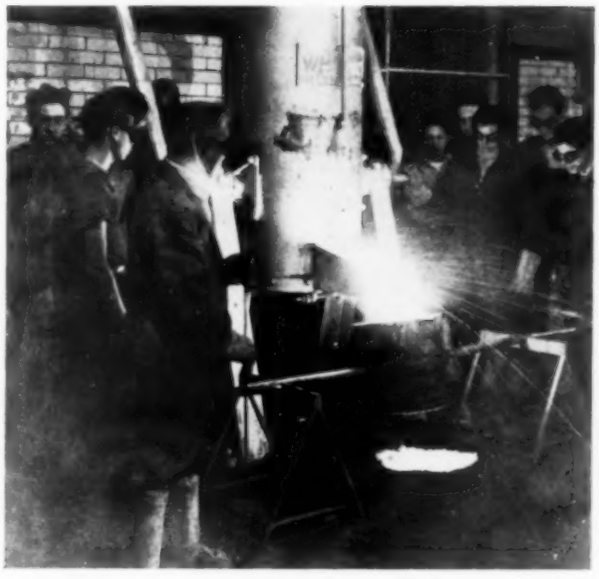

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(*Concluded from page* 104)

in the production of the alloys will give a great deal of trouble in the proper suspension of the lead since arsenic combines with the lead to increase its fluidity to the point where it flows readily and concentrates at the bottom of the mold during the solidification of the entire mass. Therefore, arsenic should be avoided.

Iron above 0.25 per cent tends to produce hard spots and complicates production of good castings. Antimony above 0.50 per cent will increase the tendency to segregation or liquidation of the lead content. Silicon above 0.01 per cent will cause hard spots and increase the drossiness. Aluminum above 0.005 per cent increases drosses and adds to the problem of segregation.

Sulphur is limited usually to the maximum point of 0.08 per cent, but it is claimed by some that sulphur assists in keeping the lead in suspension. However, if sulphur is to be used as a means of suspension and distributing the lead throughout the mass, it must be added most sparingly, and by those who understand its use. It takes experience as well as careful control for success in the use of that element as a corrective agent for segregation. An excess of phosphorus above 0.05 per cent in the final alloy will increase the tendency to segregation but the presence of phosphorus also makes the whole composition more fluid.

Pour at Low Temperature

Therefore, phosphorus permits lower pouring temperatures which may compensate to some extent for the tendency to segregate on the part of the lead under these conditions. All of this group of compositions is better poured at a low temperature so that it will set as soon as possible after pouring and thus limit the period during which the lead has an opportunity to settle to the bottom of the mold.

In Compositions 1*PP* to 1*UU* are listed some of the many combinations of copper and aluminum with, in a few instances, some iron, known as aluminum bronze. The term *bronze* having originally meant a copper-tin alloy is somewhat misleading here, in that there is no tin necessary in any of these compositions. Some tin is permitted, a fraction of one per cent, so that tin plated iron scrap may be used as a source of iron without having the content of tin resulting therefrom becoming a source of condemnation or rejection by the inspectors.

Composition 1*PP* is known as the high iron aluminum bronze, and is one of those covered by the government specifications QQB 671 (A), also by A.S.T.M. B59-36 Grade A, and S.A.E. 68(A). That composition, with composition 1*TT* come within the limits of the specification of the alloys covered by the original Vickers patent for aluminum bronze. The latter was taken out April 30, 1918 and expired on April 30, 1935, and related to alloys in which not more than 12 per cent and not less than 7 per cent of aluminum is present, and not more than 5 per cent and not less than 3 per cent of iron is present, and in which the proportion of aluminum to iron is to be not more than 2½ to 1.

Aluminum Hardens Copper

Hardening effect of aluminum on copper, of course, is dependent upon the amount of aluminum present. Since some of the aluminum combines with the iron in the alloys and thus leaves only part of the aluminum available to combine with the copper, the hardening effect upon the copper in the presence of iron necessarily must presuppose an ample proportion of aluminum to combine with both of these so as to develop the desired physical characteristics of the alloy.

Iron tends to refine the grain structure, and also reduces the tendency to embrittlement during cooling from the liquid state to the final atmospheric temperature. It is on account of that characteristic of the presence of iron in aluminum bronzes that many claim aluminum bronze without iron is likely to be low in elongation. However, the aluminum bronzes in which no iron is present frequently are made with eminently satisfactory elongation by subjecting the material to the proper heat treatment. The alloys with the higher iron content do not respond to this heat treatment but are used as cast.

This is the sixth of a series of articles by Mr. Patch on nonferrous alloys available to the foundryman. Previous articles have appeared in the January, February, March, April and May issues. Another will appear in the July issue.
THE EDITORS.

Makes Appointments

Ransome Concrete Machinery Co., Dunellen, N. J., recently has appointed the following as district representatives to handle their new welding table and positioner: Industrial Supply Co., Salt Lake City, Utah, which will cover Utah, and parts of Idaho, Montana, Nevada and Arizona; Johnson Supply Co., 1414 Wazee street, Denver, Colo., whose territory will include Wyoming and part of South Dakota, Nebraska, Colorado, and New Mexico; J. E. Hazeltine & Co., 115 Southwest Second street, Portland, Ore., in Oregon.

Detroit Foundries

(*Concluded from page* 34)

power plant developed by Waukesha Motor Co. for the 2-cylinder air-cooled motor used in the midget Crosley car, is a cast iron flywheel on the outer rim of which are integrally cast blades arranged in such a position that they draw air across the engine block to cool it. The motor develops 15 horsepower at 4300 revolutions per minute, giving top speed in the car of 50 miles per hour at economy ranging from 50-60 miles per gallon of gasoline.

While the Crosley has been unveiled to the press and to distributors of the company, assemblies of the car are slow to get started in the company's plant at Richmond, Ind. Reports are heard that an initial lot of 5000 motors has been released. First year's contemplated production of this $350 job has been variously estimated at from 25,000 to 50,000 cars.

Book Review

Aluminum Bronze, cloth, 151 pages, 6 x 8½ inches, published by the Copper Development association, Thames House, Millbank, London, England. Copies may be secured free of charge by those giving satisfactory evidence of responsible status or genuine interest.

This volume is another valuable addition to the some twenty or more publications relating to copper which have been made available by the Copper Development association. It is divided into seven chapters concerned with various phases of aluminum bronze. The first chapter on general properties discusses equilibrium diagram, density, general features of the alloys, electrical and thermal conductivity, etc. Chapter II is devoted to alpha or cold working bronzes, and describes effect of cold working, annealing, impact properties, and microstructure. Chapter III is concerned with hot working bronzes.

Aluminum bronzes for casting is the subject of chapter IV, and covers such items as typical casting alloys, influence of added elements, heat treatment and microstructure, and comparison of aluminum and manganese bronzes. Chapter V deals with corrosion resistance while chapter VI discusses production and fabrication of aluminum bronzes. Industrial applications of aluminum bronze are described in chapter VII. The volume also contains an appendix comprising a bibliography, specifications and the index.

Harnischfeger Corp., Milwaukee, has moved its Detroit district offices to 845-46 Book building, Detroit.

ADVERTISING PAGES REMOVED

Mold Stern Tube

(*Continued from page* 35)

shape of the flask is of no particular importance.

The layout shown in Fig. 5 was prepared to mold the stern tube casting. The method saved time in patternshop and foundry, reduced pattern cost to a minimum and eliminated all cost of flask equipment. The sketchy pattern equipment included two half flange patterns *A A*. The flange at the left was fitted with a half print to receive the lower end of the core when the mold was closed and raised to a vertical position. The upper half flange *A* shown at the right had no print attached.

To prevent end movement of the spindle, a collar was attached by a set screw at each end and close to the end plate of the flask. The main body sweep board *B* and additional part *C* designed to form the extension or shrink head the full diameter of the upper flange were attached to arms on the spindle in the usual manner.

Inside surface of the casing was claywashed after which the casing was rammed full of sand and swept to shape as in roll practice. Flanges *A A* were held in place by a rectangular frame screwed to the flange patterns and clamped to the edges of the flask. The firebrick inlet gate, shaped to match the contour of the flange at one end and the length of steel pipe employed as a sprue, at the other end, was bedded in place as the ramming of the sand progressed.

To insure a close joint on the finished mold, the joint surface on each half was made up accurately and struck off flush with the machined joint on the casing. Later in closing the mold, the usual paste roll was placed on each side between the half molds to insure intimate contact and prevent any metal from leaking through.

After the joint was trued and slicked on the first half of the mold, the spindle and boards were removed, the flanges drawn and the pipe sprue pulled through a hole in the end plate. With the exception of the pipe, the rigging was placed in the second half casing and the cycle of operations repeated. Both half molds were surface nailed and silica washed before they were placed in the oven. A small amount of bentonite was added to the silica wash to give it a better grip on the face of the mold. After the mold was dried a number of brackets were cut with a hack saw at the junction of flange and body.

Detail of coremaking procedure is shown in Fig. 6. One half is shown partly swept, with the loose rod reinforcement and large central coke vent. The core was made and dried in halves. After leaving the oven the halves were joined to form a compact column, resistant to the molten metal, yet designed to yield readily during the cooling or contracting period and easily removed in the cleaning department.

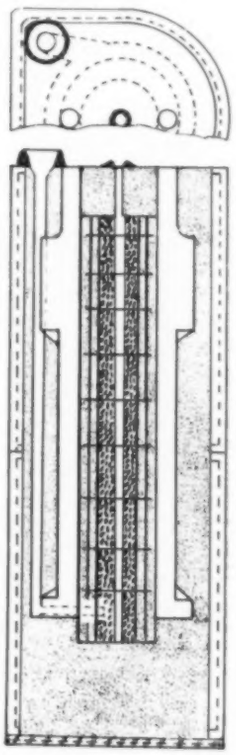

Fig. 7—Assembled stern tube mold in vertical position ready for pouring. Plan view shows tangential gate arrangement flaring toward junction of gate and casting

Fig. 7 shows a sectional view of the mold in vertical or pouring position. Two 4-inch diameter risers were placed on top of the 18-inch high extension collar. The top view shows that the tangential gate is larger at the point where it joins the flange, than it is at the junction with the sprue.

Compared with the total amount of metal poured into the mold, a final checkup showed a yield of 73 per cent in saleable casting volume.

Foundry department of the American Rolling Mill Co., Middletown, O., recently was awarded the *Iron Man* trophy of the company for its completion of a year without loss of time because of illness by any of its 97 men. That department has also completed 2 full years of no lost-time accidents.

A.S.T.M. Arranges June Meeting

More than 20 separate technical sessions will be held at the 1939 annual meeting of the American Society for Testing Materials which will take place at Chalfonte-Haddon hall, Atlantic City, N. J., on June 26 to 30. Important technical features are discussions on effect of subatmospheric temperatures on properties of metals and freezing and thawing, quantitative spectrochemical analysis, paint testing, and shear testing of soils. In addition there will be groups of papers covering fatigue of metals and other subjects. Also listed are papers on magnetic analysis, modern methods and applications, and the history and utilization of the Alloy Casting Research institute test block for heat resisting alloys.

In addition to the meeting there will be an exhibit of testing apparatus and related equipment on display and several A. S. T. M. committees will sponsor exhibits on corrosion of nonferrous metals and alloys, metallography, fire tests of materials and construction, etc. Photographs entered in the second annual photographic competition devoted to "Testing and Research in Engineering Materials" also will be on display.

Book Review

Design of Industrial Exhaust Systems, by John L. Alden, 220 pages, published by the Industrial Press, New York, and supplied by THE FOUNDRY, Cleveland, for $3.00 and in Europe by the Penton Publishing Co., Ltd., London.

The purpose of this book, as ascribed by the author, is to tell the engineer how to design and build or how to buy an exhaust system that adequately and economically will perform the functions prescribed by the industrial hygiene expert or by the law. The work combines the theory of air flow to specific applications of exhaust systems in industry.

The text covers the following subjects: Flow of fluids, hood forms, air flow through hoods, pipe resistance, piping design, dust separators, low pressure conveyors, centrifugal exhaust fans, structural details and system planning, field measurements and their interpretation.

In addition to the number of references given, the author should have referred to the tentative recommended good practice code and handbook on the "Fundamentals of Design, Construction, Operation and Maintenance of Exhaust Systems" as developed by the A.F.A. industrial hygiene codes committee.

Problems In Steel Castings

(*Concluded from page* 38)

fiance of the laws of nature.

To a reasonable extent a foundryman can produce a casting free from entrapped dirt resulting from cutting of the mold refractories, as well as a metal sound and free from blow holes, segregation, and other metallurgical imperfections. However, the extent to which castings are free from many physical defects resulting from adverse solidifying conditions, depends largely upon the degree of co-operation between designer and foundryman in co-ordinating design and foundry practice, and in consideration of welding and other factors.

There are many instances of specifications for alloy steel castings which call for physical properties of a very high order without reference to limitations of intricate shapes to be heat treated safely to develop these properties.

Foundrymen familiar with heat treatment of alloy steel recognize the inability to heat treat shapes with great variations in cross section by methods such as quenching or even drastic air quenching. Due to the nonuniformity of this treatment on greatly varying metal sections such parts frequently will be warped or distorted badly. In many cases the castings will have far less integrity in actual service than castings of the same shape made of a steel less drastically heat treated.

Treat Uniform Sections

Generally, drastic heat treatment of steel castings should be confined to those so uniform in cross section that appreciable variations in hardness throughout the sections will not be encountered. This general principle invariably is followed for wrought steel products and it is unreasonable to expect castings to be less susceptible than wrought products of the same compositions to the dangers resulting from treatment of nonuniform sections.

Welding of steel castings always has been a source of controversy between designers and steel foundrymen. Some justification may have existed in the early days when the art of welding had not reached its present state of development. Many customers frown upon welding for the correction of imperfections in castings, notwithstanding the fact that component parts of the same assembly into which the castings go may be made by weldings produced from wrought steel. Progressive foundries have developed welding technique following recognized standard practice. Many discriminating users have set up welding codes in their own operations which have permitted a broader, safe utilization of steel castings than would have been possible with a strict prohibition of any welding operations.

It seems hardly fair to class the welding of castings as repair welding in view of the fact that this welding is necessary to overcome certain limitations in design which must be imposed on the foundryman. For products made from an ingot, forgings, bars, etc., welding may be termed strictly repair welding. However, in many castings the practice of welding, controlled by good technique, is a distinct aid and should be regarded as one of the operations necessary for accomplishing certain types of work. From time to time designers and engineers, recognizing the shortcomings of the design, definitely expect cracks to appear in certain parts of the casting. These cracks are formed deliberately in positions where they can be welded readily.

Welding Offers Advantages

When welding follows the fundamental welding technique laid down by American Welding society, insofar as it applies to cast steel, one should have no reason to question the integrity of such castings. Many foundrymen are prejudiced against weldings, probably because they have been considered competitive products. In reality they offer actual advantages if the foundryman would co-operate more closely with the welding engineer by incorporating castings and wrought materials in weldments of intricate design.

Recent literature has shown many instances of complicated engineering design developed through the incorporation of cast members and simple wrought shapes in a composite structure. They offer many advantages over integral one piece castings and weldings made up entirely of wrought metal. Greater confidence in the integrity of welded joints, in castings and wrought materials, and closer co-operation between steel foundrymen and welding engineers undoubtedly will be beneficial mutually to both important branches of modern metal industry.

One of the recent and most controversial issues in the steel casting industry is the question of nondestructive testing of castings, by radiography and similar methods. Until recently foundrymen have been disposed to regard with suspicion even the suggestion that their product be examined critically by any of these methods of nondestructive testing.

Attitude of the industry as a whole on the subject of radiography, as it existed some years ago, is brought out in the 1936 A.S.T.M. *Symposium on Radiography*. Through the work by the committee on radiography, the American Foundrymen's association and other engineering societies, viewpoints on the values of that method of testing are changing.

In the early application of radiography to the examination of steel castings, proper attention was not paid to intelligent interpretation of the findings. Neither was due consideration given to whether defective conditions observed were inherent or even dangerous. Under this early method of inspection any imperfection was looked upon as a more or less serious shortcoming on the part of the foundryman. The standard of inspection was a clear film.

With the more liberal attitude assumed by many radiographists today, it has been possible by nondestructive testing to examine cross sections of castings so located that suspicion may be held in regard to soundness. Any faulty condition then may be corrected by properly controlled repairs on castings already completed and by changes in the design to eliminate the difficulties permanently. Generally speaking, radiography is useful in the hands of both designer and foundryman. Properly practiced it should be of great aid in increasing the consumer's confidence in the integrity of steel castings.

Radiography Gives Assurance

Recent discussion with a designer of castings showed that radiography was being resorted to because it was recognized that the inherent limitations of design probably would result in weaknesses in certain sections of the casting vital to the successful application of the part in service. These sections, properly explored, repaired by welding and checked by radiography for soundness of weld, would be used with absolute confidence. In the same type of casting, under previous conditions, without the aid of radiography, a general suspicion would prevail in regard to the integrity of the product.

In the opinion of the author the foundryman's active participation in the advance of radiography, as it applies to important castings, ultimately will prove a boon rather than a handicap, to the industry.

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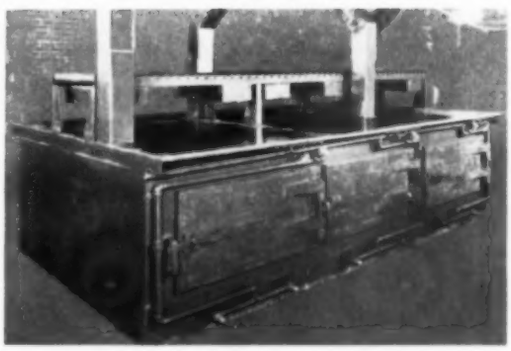

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European Foundry Practice

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High Strength

Some Notes on Making High-Duty Cast Iron, by J. H. Williams, *Foundry Trade Journal*, London, England, Feb. 23, 1939.

After brief reference to the historical phase, the author touches upon the Lanz-Perlit and Emmel processes of making high strength iron, and then describes various other procedures including addition of nickel, nickel-molybdenum, nickel-chromium, and the inoculation processes such as meehanite and ni-tensyl. Of particular interest is one method in which the author describes a method of securing a high-test iron with a tensile strength of over 49,000 pounds per square inch. Raw materials are steel scrap, white iron, silicon briquets and carbon-free manganese briquets. The white iron is made in the cupola by melting down steel scrap and pig iron with extra manganese, and desulphurizing with soda ash.

Aluminum Alloys

Heat Treatable Aluminum-Silicon Alloys (Alliages d'Aluminium-Silicium a Traitment Thermique), by Gaston G. Gauthier, *Bulletin*, de l'Association Technique de Fonderie, Paris, France, December, 1938.

In discussing the results obtained with heat treatable, cast alloys of aluminum-silicon containing in addition magnesium, manganese or cobalt, the author presents tables showing variations in physical properties under influence of heat treatment and differences in silicon, magnesium, iron, manganese, cobalt and sodium contents.

Investigations were made on sand cast and chill cast specimens although only results obtained with sand cast specimens are given. According to the author the purpose is not to supply any new results, but to group the data obtained in the course of investigations and thus supply a source of reference which should prove useful to foundrymen and designers.

Nickel Recovery

Reclamation or Reworking Nickel Scrap and Discards in the Foundry (Zur Verarbeitung von Nickelschrott und-abfaellen in der Giesserei), by Edmund R. Thews, *Die Giesserei*, Duesseldorf, Germany, March 10, 1939.

First step in reclaiming pure nickel and high nickel bearing scrap is the separation of the various kinds. That must be done carefully since they are quite similar in color. Several types of melting units can be employed, and while the author prefers the electric furnace, open flame and crucible furnaces may be used. Graphite crucibles should be given an interior coat of refractory clay to prevent carbon pick-up. Metal being melted should be protected against gases of combustion to prevent absorption of sulphur and gases.

For a protective covering the author recommends a mixture of calcined sodium and potassium carbonates or broken glass. For deoxidation and desulphurization about 0.15 to 0.2 per cent of magnesium can be employed although it may be advisable to use 0.15 per cent manganese followed after 2 minutes by 0.05 to 0.1 per cent magnesium. However, the author prefers a magnesium-aluminum alloy (about 50-50) for the purpose claiming complete deoxidation and desulphurization with 0.125 per cent. He also recommends the removal of the first slag previous to desulphurization and deoxidation and building a new calcium silicate slag formed by broken glass to which a handful of limestone is added.

Spectrography

Spectrographic Analysis and Its Application to Aluminum Alloys, by J. R. Handforth, H. W. Whymper and W. M. Boulton, *Metal Treatment*, London, England, Quarterly, Spring, 1939.

In introducing the subject of spectrography, the authors first discuss the general principles of spectrographic analysis and the methods employed. Then they give details of application of the process to aluminum alloys. Basis of the procedure employed is measurement of intensities of homologous lines of major and minor constituents, and for simplicity logarithmic paper is used for construction of comparison curves. Standard curves are prepared from alloys of known composition, and wrought electrodes cannot be employed for examination of unknowns in the as-cast state. According to the authors two operators can analyze in one shift 60 samples of duralumin for four elements magnesium, mangarese, silicon and iron. By slight modification of working conditions, the speed can be increased appreciably.

Patternmaking

The Patternmaking and molding of a Worm of Varying Pitch, by G. N. Johnson, *Engineer and Foundryman*, Johannesburg, South Africa, April, 1939.

This article, which was submitted in a short paper contest sponsored by the South African branch of the I. B. F., and garnered the first prize, describes details followed in constructing a pattern for a worm 8½ inches outside diameter with the pitch changing from 6¾ to 6¼ to 5¾ inches. The author states that the method provides a finished worm which is perfectly accurate, and if desired the production of the pattern can be divided between two patternmakers and the job finished in about 2½ days, compared to two or three weeks by the old methods.

Cupola Study

Investigation of Some Relationships Between Variables of the Cupola, by M. M. Barigozzi, *Foundry Trade Journal*, London, England, Feb. 23 and March 2, 1939.

This article describes preliminary work from which it is believed that reasonably accurate formulas may be compiled to indicate relationships between cupola bed height, rate of melting, diameter, amount of air, etc., so that more efficient melting may be secured or better cupolas designed. Work is based upon a survey conducted by the Associazione fra gli industriali meccanici ed affini, Italy, on construction and operation of nearly 100 cupolas in service. The author has developed some interesting data which he admits must be amplified by more extended study and more accurate figures.

Powdered Metals

Manufacture of Nonporous Alloys from Powders, by W. D. Jones, *Metal Treatment*, London, England, Quarterly, Spring, 1939.

Powder metallurgy permits manufacture of porous or nonporous products. In the past greater attention has been given to preparation of the former because those could not be obtained in any other manner. However, nonporous alloys produced from powders are becoming increasingly important, and the author describes two available methods for such work. One is cold pressing followed by heat treatment, and the other hot pressing at sintering temperature. He also discusses phenomena involved in formation of nonporous compacts by cold pressing, and compares the relative advantages of the two methods.

Microscopy

New Procedures in Microscopic Investigation of Metals (Neuere Verfahren zur mikroskopischen Untersuchung von Metallen), by F. Roll, *Die Giesserei*, Duesseldorf, Germany, Jan. 13, 1939.

In introducing his discussion of microscopic methods, the author points out the value of the instrument to the study of metals and alloys. He then discusses the resolving power of microscopes describing the new electron microscope, and use of the vacuum table or platen for study at high temperatures. Other phases included in the article are use of polarized light, the dark field, fluorescence, etching technique, microhardness, and faults or defects in microstructure.

Make Progress

Progress in the Aluminum Casting Field Through Foundry Technique and Testing Methods (Fortschritte auf dem Aluminiumgussgebiet durch Giesstechnik und Pruefmethoden), by J. Dornauf, *Die Giesserei*, Duesseldorf, Germany, Dec. 30, 1938.

The author discusses progress made in aluminum castings through development in foundry procedure and in suitable testing methods. He cites the production of cylinder blocks in metal molds and by a combination of metal molds and sand casting as a result of those developments. Methods of test include x-rays and sectioning. The limits of such methods in locating certain defects are discussed. The author also mentions that use of oil immersion, drying thoroughly in sawdust and then coating with chalk or whiting is excellent for locating fine cracks.

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Sawed or Split

---a natural rock for LINING---

Soaking Pits . . . Blast Furnace Ladles
Bessemer Converters . . . Mixers
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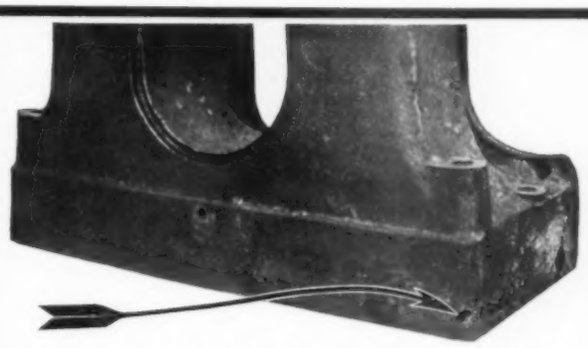
LASTS LONGER COSTS LESS

Write for Literature

The Cleveland Quarries Co.
1125 Builders Exchange Building
Cleveland, Ohio



FILL SURFACE PITS with SMOOTH-ON No. 4

SCRAPPING this sound casting because of a few harmless sand holes or other surface depressions would be the height of folly, but—for best sales value, the surface should be filled to true contour.

Smooth-On No. 4 gives universal satisfaction in this service because it is quickly applied, hardens into metallic iron, can be filed or machined like iron, and costs so little that the saving of a single large casting easily pays for a whole year's supply.

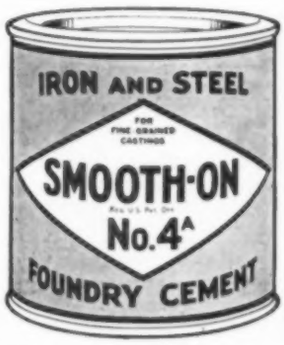
Three compositions, each with distinct color, degree of lustre and fineness of grain offer a choice for perfect match in iron and steel castings of any shade, appearance and quality.

Smooth-On No. 4AA. For light gray castings and machined surfaces. Has high metallic lustre and takes a fine machine finish

Smooth-On No. 4A. For medium gray castings. A fine-grained cement that has a good metallic lustre

Smooth-On No. 4B. For dark gray castings. A cement of coarser grain and darker shade

Castings judiciously treated with Smooth-On No. 4 pass any inspection, and sell for the highest price. Make a critical test, and you will find your filling problems well solved.



FREE
HARDENED and WORKING
SAMPLES

Smooth-On Nos. 4AA, 4A and 4B packed in 1-lb. and 5-lb. can, 25-lb. pail or 100-lb. keg. Mail coupon for prices and free hardened and working samples.

Smooth-On Mfg. Co., Dept. 17,
570 Communipaw Ave., Jersey City, N. J.

Please send samples of ☐ Smooth-On No. 4AA ☐ Smooth-On No. 4A ☐ Smooth-On No. 4B

Name.....

Address.....

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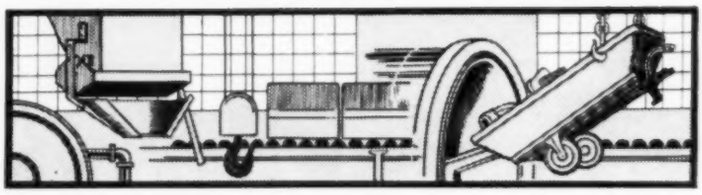
***Do it with* SMOOTH-ON**

NEW EQUIPMENT



AND SUPPLIES

Flexible Shafting

Stow Mfg. Co., Binghamton, N. Y., recently has developed two new pieces of equipment for use on flexible shafting power drives. One is an angle head and the other is a reciprocating handpiece. The angle head is designed for heavy duty with cup shape grinding wheels and brushes, sanding and polishing sets. Spindles are mounted in oversize,

grease-sealed ball bearings. Housing is aluminum and is supplied either for wet or dry grinding. Diameter is 3½ inches with overall height of 6⅛ inches. The head operates at speed ratios from 1 to 1 to 20 to 1 reduction.

Reciprocating handpiece is made to convert rotary motion of flexible shaft to reciprocating action with 1-inch stroke. Files and saw blades with ¼-inch shank can be inserted in handpiece. It is designed for use at speeds not to exceed 1000 revolutions per minute. Handpiece is interchangeable in same size range with other flexible shaft attachments.

Core Binder

A new process whereby milk solids are used as a binder for sand cores, has resulted from several years operation of a research fellowship established by the Borden Co. at Mellon institute, Pittsburgh. A new product, produced by the process has been introduced by the Casein Co. of America, division of the Borden Co., 350 Madison avenue, New York. It is claimed that the new binder burns freely and quietly, thus contributing to a smooth surface of the casting, and provides a core which may be shaken out easily and quickly. The cores made with this binder are said to be hard and strong, yet collapsible under heat.

Briquets

Climax Molybdenum Co., Langeloth, Pa., has developed a molybdic oxide briquet for alloying iron and steel. Briquets are 5-pound cylinders, 3½ x 4½ inches, composed of a mixture of technical molybdenum trioxide and a sulphur-free pitch binder. Each contains 2½ pounds molybdenum.

The briquets were developed primarily to provide an economical and convenient means of making additions of molybdenum to cast iron in the cupola, electric furnace or air furnace. They also are said to provide advantages as a means of adding molybdenum to steel.

Proportions of molybdenum and carbon are such that the briquets are claimed to be self reducing. At the temperature of molten iron or steel, molybdenum trioxide is reduced by the carbon, first to one of the suboxides of molybdenum, and then progressively through the lower oxides of metallic molybdenum, which are absorbed by the metal in the bath. Carbon dioxide passes off as a gas. There is said to be no carbon pickup by the metal in the bath.

Briquets also are intended for direct addition to the cupola or furnace charge; they are not suitable for making ladle additions. When electric or air furnaces are used, briquets can be added either to the cold charge or when the bath is molten. They also can be added either to cold charges of steel or to the molten bath.

Made Agents

Hickman, Williams & Co., has been appointed agents for the Sloss-Sheffield Steel & Iron Co., Birmingham in the Cleveland and Pittsburgh territories.

Car Spotter

Link-Belt Co., 2410 West 18th Street, Chicago, has developed a car spotter in two sizes for economically and quickly spotting railroad cars in position for loading or unloading. The vertical capstan electric device shown in the accompanying illustration in one size, develops a rope pull of 5000 pounds for moving one to three cars. The larger

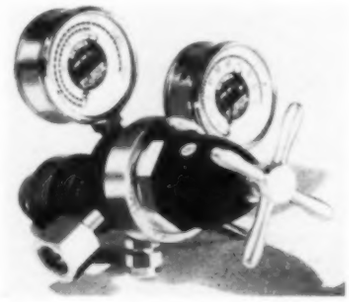
size with a rope pull of 10,000 pounds is capable of moving from three to six cars depending upon track condition, level, grade, straight or curved.

The machines employ a high torque electric motor of user's choice, connected to spotter driven mechanism by an encased flexible roller chain coupling and mounted with spotter on a steel base plate. The vertical cast capstan is machine finished to prolong life of the cable. Gearing is completely housed and protected in a sturdy housing. A ratchet and pawl mounted inside the capstan are supplied when required for holding cars on an incline when the power is off. The smaller size is equipped with a 5 horsepower motor. Motor on the larger size is rated at 10 horsepower. The company also builds another type spotter of the same capacities, but more self contained and compact requiring no separate base plate and with the motor mounted on the side of the car spotting machine.

ADVERTISING PAGES REMOVED

Regulators

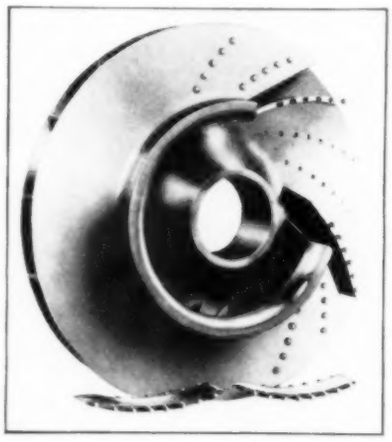
Three new regulators recently have been introduced by the Linde Air Products Co., unit of Union Carbide & Carbon Corp., 205 East



42nd street, New York. These regulators utilize the principle of 2-stage regulation. A fixed first stage reduces the pressure of oxygen or acetylene from cylinder pressure to a moderate figure below which it is regulated by the variable second stage of regulation. Stem type valve mechanisms give uniform flow of oxygen and acetylene to the lower pressures at which the gases are used and in quantities sufficient for practically all welding and cutting operations.

Impeller Wheel

Allis-Chalmers Mfg. Co., Milwaukee has developed an interesting method for construction of impeller wheels for turbo blowers, as shown in the accompanying illustration. The wheels are of the enclosed or shrouded type with blades curved away from the direction of rota-



tion. The hub disk and cover are machined from single piece forgings of chrome-vanadium steel, heat treated to give maximum strength consistent with proper ductility. The blades are forged, heat treated chrome-vanadium steel plate cut to rough size. The blades are milled out on the sides, leaving material from which to form the rivets as an integral part. The blades are bent cold to shape. They are first riveted to the hub disk, after which the cover is dropped into place. Before they are assembled the blades are weighed on a special scale, at the diameter at which they will be located with respect to the center line of the rotor. Equal blades are placed opposite each other on the wheel. Each completed wheel is balanced both statically and dynamically and is given an over speed test 25 to 30 per cent over the maximum speed to be encountered in service.

Electric Motor

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has introduced a series of hoist motors designed for severe intermittent service where frequent starts, stops and reversals are encountered. The high resistance rotor provides highest ratio of

starting current obtainable with a squirrel cage motor. It is claimed the motor causes minimum disturbance to the line and permits the use of a low cost full voltage starter on the majority of installations. The motor will handle light loads quickly while heavier loads cause the speed to decrease with the corresponding increase in torque.

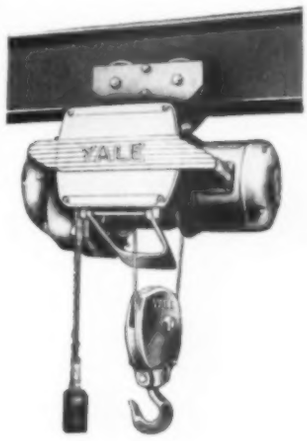
Ball or sealed-sleeve bearings can be supplied especially designed both to exclude dirt and foreign particles and prevent loss of lubricant.

Lift Skid

Lewis-Shepard Sales Corp., 245 Walnut street, Watertown, Mass., has introduced a new materials handling method consisting of a semilive skid and a 2-wheel lifting unit. The lifting unit is equipped with large dual wheels and roller bearings. Lifting is accomplished with a direct action single stroke. The carrying platform has a hardwood top entirely surrounded by a steel frame. Double side girders hold the hardwood top in place without the use of bolts or rivets. There are no exposed board ends. Platform wheels are equipped with pressure lubrication and roller bearings, and may be either metal or rubber tired.

Air Cooled Hoist

Yale & Towne Mfg. Co., 4530 Tacony street, Philadelphia division, recently has placed on the market an improved type of electric hoist,



shown in the accompanying illustration and available in capacities from ¼ to 6 tons. In the new hoist a blower action is applied which produces what is claimed to be an effective degree of low pressure air circulation and cooling on the brake frictional parts, thus eliminating excess brake heat. Fins, simulating a sirocco blower are cast in the brake drum in the line of the air stream. As the load is lowered the fins revolve producing an air circulation and cooling action that forces a constant flow of cool air around the brake and gear housing. Vents in the bottom of the housing insure free circulation of air.

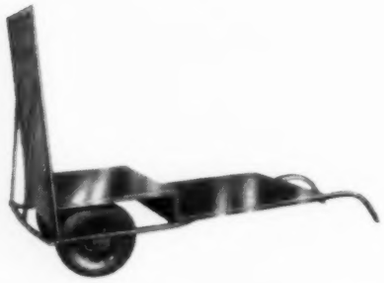
Bench Grinder

Stanley Electric Tool division, New Britain, Conn., now is offering a new bench grinder ¼-horsepower motor, 110 volts, full ball bearing, 6-inch wheels as shown in the accompanying illustration. It is claimed that the new grinder is par-

ticularly suited for general grinding, sharpening tools, buffing, polishing and wire brush work. The grinder is equipped with sturdy wheel guards, tool rests, toggle type switch, 3-wire rubber covered cable, rubber feet, two 6-inch wheels one coarse and one fine.

Flask Truck

Chicago Mfg. & Distributing Co., 1928 West Forty-sixth street, Chicago, recently has developed a new foundry truck for conveying flasks, jackets and bottom boards. It is claimed that the operator can carry



twice the load with much less effort. The truck, shown in the accompanying illustration, is said to provide perfect balance at all times. The entire truck is fabricated from 12-gage sheet steel and reinforced and welded throughout. Sixteen-inch diameter, 4-ply pneumatic tires with tubes are used.

The flat loading surface of the truck has an area of 15 square feet, the front vertical nose is 3 feet high, the width of the truck is 3 feet. Approximate weight of the truck is 215 pounds.

Portable Hoist

Chisholm-Moore Hoist Corp., Tonawanda, N. Y., has added to its line a portable Comet hoist, easily carried and installed by one man and powered by a heavy duty, high torque motor that operates on cur-

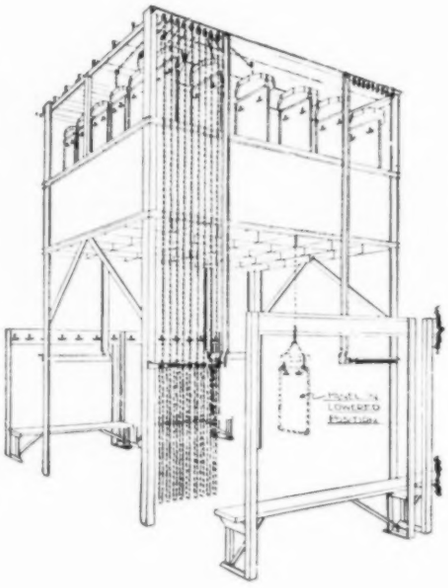
rent from an ordinary light circuit. It is recommended as a materials handling unit where use of heavy equipment is too costly. Hoist is readily adaptable to production lines in large plants.

In the construction of this hoist ball bearings are provided at all rotating points. Gears are precision machined of heat-treated alloy steel. Controller, with delayed reversing feature, operates easily with one hand and affords sensitive control for lifting load distances of a fraction of an inch. Brake prevents drifting of load.

Hoist is offered in four capacities: 250, 500, 750 and 1000 pounds; and several speeds are available. The 500-pound size weighs only 85 pounds

Overhead Lockers

Lyon Metal Products Co. Inc., Aurora, Ill., has developed a type of locker for workrooms in which the clothing is kept near the roof where the air is warmer, dryer and

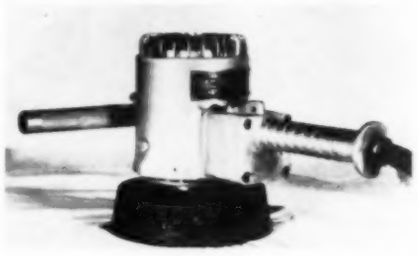


fresher than it is near the floor level. A steel superstructure supports the cubicles. Combination clothes pan and panels are suspended from the top with chains for raising and lowering. Chains are padlocked to superstructure. Each locker unit has a pan 2½ inches deep to hold hat or any other personal belongings. The pan supports a panel with hooks on either side for clothing. Fusible links are provided at three points of each unit. In the event of a fire in any unit these links permit the clothing to fall to the floor.

Sturdy bench and clothes rack are built as one assembly. Uprights support a cross member on which are convenient clothes hooks. Bench seat is yellow pine sanded and shellaced. Superstructure is bolted together and braced to insure rigidity. Installation may be dismantled and moved if necessary. This type of locker system is available on single and double faced units.

Portable Grinder

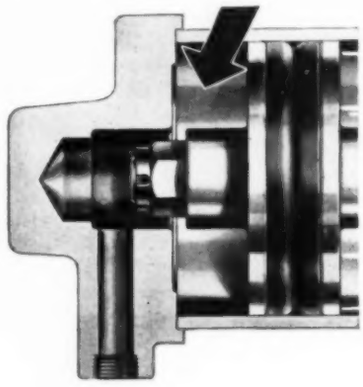
Gaston Power Tools, Evergreen Park, Ill., recently has placed on the market a new type portable grinder shown in the accompanying illustration. It is claimed that



this disk grinder cuts fast and leaves a smooth path even when a coarse grinding wheel is used. The machine has only two bearings and no gears. The motor will develop a maximum of 2 horsepower. The device has no brushes and the winding is enclosed in a dust tight case. Although the grinder weighs only 15 pounds it will drive a 7-inch diameter disk grinding wheel at a speed of 3400 revolutions per minute. The machine is designed to operate directly from a regular 230-volt, 3-phase, 60 cycle power circuit.

Air Cylinders

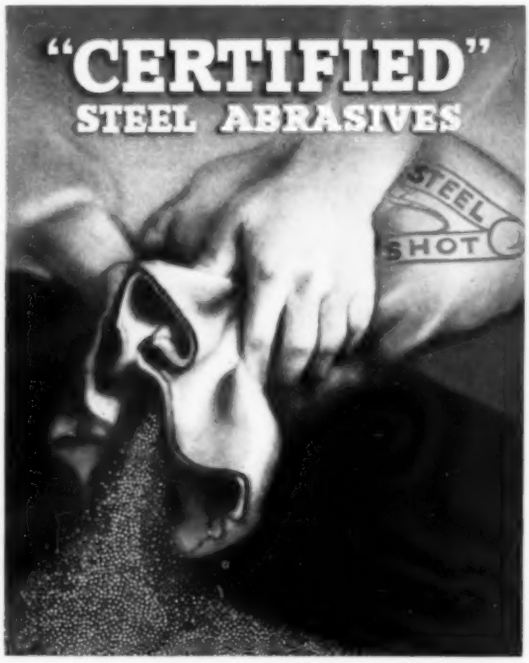
Galland-Henning Mfg. Co., Milwaukee, Wis., has developed a line of air cylinders with nonadjustable cushion heads. The cushion type air cylinder is said to eliminate noisy, destructive, metal-to-metal impact, and to prolong cylinder life.



Smoother, more efficient operation and lower maintenance costs for air powered equipment also are claimed.

Opens New Office

Moltrup Steel Products Co., Beaver Falls, Pa., opened a new Cleveland office on May 1, located at 1199 Union Commerce building. The office will be in charge of A. G. C. Quay.



HOW MUCH WORK ... PER DOLLAR?

That's the only important question to ask when buying steel abrasives for your many blast cleaning requirements. For the brand *that does the most work per dollar* is your one best bet for profitable blast cleaning.

Fifty years of experience making and selling "Certified" Steel Shot and Grit qualifies us to answer the question. WE KNOW that "Certified" Steel Abrasives are the toughest, hardest abrasives on the market today. New processing developments have increased crushing strength approximately 40%—*a vital factor in economical blasting life!* Skeptical? Let us prove what we know are facts. No obligation or cost. Just write us for "Certified" Steel Abrasive data today!

PITTSBURGH CRUSHED STEEL CO.
PITTSBURGH, PENNA.
STEEL SHOT AND GRIT CO.
BOSTON, MASS.

ANOTHER *Fisher* DEVELOPMENT
S.P.C. TILTING MELTING FURNACE

Tilted with Either Electric or Hand Hoist

•

No Impingement of Waste Gases

•

Constant Pouring Arc

•

Built Low for Ease in Charging

The Fisher S.P.C. is recommended for melting yellow brass and for pouring into ingot molds or transfer ladles.

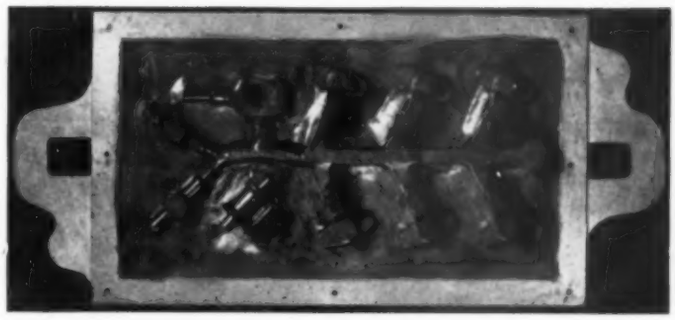
Metal losses are reduced to 5% or less when charging borings—1% on solid scrap and ingot metal.

Tilts at the nose—producing a constant pouring arc. Oil or gas fired.

Write for catalogue
"Fisher Products for the Foundry Industry."

"Builders of Melting Furnaces for 32 Years."

FISHER FURNACE CO.
1826 No. Lamon Ave. Chicago, Illinois

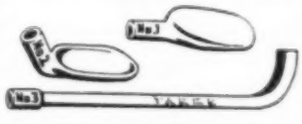


Large or Small Foundries
Increase PRODUCTION and PROFITS
with **TAMASTONE**

If loose pattern work is costing more than it should and finished castings are not showing substantial PROFITS, you need—TAMASTONE, *"The Perfect Pattern Compound!"* Try it on your own work—see for yourself how production costs can be cut and foundry earnings stepped up! Specification and price sheets sent on request.

Pyramid PYROMETER

★ Establishes accurate temperature readings of molten, non-ferrous metals from zero to 2500° F. Has magnifying reading glass, pistol grip handle, thumb screw adjuster. Thermo couple unit mounted on flexible shaft. Get bulletin now!



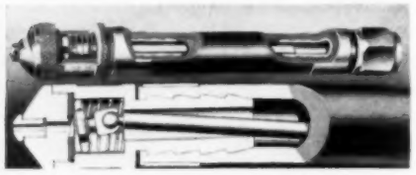
Pyramid SKIMMERS

★ Scientific assurance against contamination of finished castings. Made of heat resisting alloys that withstand temperatures up to 2500° F. Write for literature and prices!

Foundry Division — TAMMS SILICA CO.
228 N. LaSalle St., Dept. F6 Chicago, Ill.

Check Valve Unit

Air-Way Pump & Equipment Co., 625 West Jackson boulevard, Chicago, has developed a new check valve unit which screws onto the hose. Developed for use in foundries, machine shops, and other industries where compressed air is



used for cleaning, this handy air valve employs a special ball and socket joint with enclosed actuating lever which eliminates protruding buttons or levers, as well as packing glands. Those particular features are claimed to possess numerous advantages.

As indicated in the accompanying illustration, all operating parts are shielded in the valve and air hose. A slight pressure between thumb and finger to flex the hose gives a free flowing volume of air with instant, positive shut off when hose is released. It is supplied with either male or female fittings for convenient attachment and removal from the hose. It is made of brass and stainless steel for ⅜, 3/16, and ¼-inch hose. A selection of nozzles is available for various types of work.

Face Guard

Willson Products Inc., 262 Thorne street, Reading, Pa., has developed a shield, shown in the accompanying illustration, for guarding the worker's face in light grinding operations, wood working, spot welding and other activities of a somewhat similar character. It is claimed that the shield permits clear vision in all directions unimpaired by any obstructions.

Made of thick transparent cellulose acetate it is well ventilated and large enough to fit comfortably over correction spectacles. The shield extends well back along the sides of the face and easily is thrown back when not in use. Light in weight and provided with a special knitted sweat pad it is claimed that workers have no objection to wearing it. Adjustable molded rubber head band and all other parts are easily replaceable. The shield may be had in clear, amber or green transparent cellulose.

Wheel Center

Ever-Tru Abrasive Wheels Inc., 145 Hudson street, New York, has developed a type of grinding wheel in which the distinguishing feature is a metallic center with an elestic woven wire mesh of special alloy

spring steel lying in the center of the wheel. The wire mesh lies between the abrasive part of the wheel and the center and it is claimed insures constant contact between the wheel and the object being ground. This is due to permanent, automatic self balancing attained by the centrifugal action of the center with its elastic wire mesh insert. One of the many advantages claimed for this type of wheel is that it decreases normal fatigue of workman through reduction in shaking and vibration action.

Small Diesel

New diesel engine developed by the Caterpillar Tractor Co., Peoria, Ill., is a 4-cylinder model with 3¾-inch bore and 5-inch stroke, developing 33 horsepower at 1525 revolutions per minute. This engine has a four stroke cycle, solid fuel injection into precombustion chambers, valve in head and water cooled design. A 10-horsepower gasoline engine is used for starting. On the front of the fuel filter housing is a hot water manifold designed to regulate the temperature of the fuel oil with varying weather conditions.

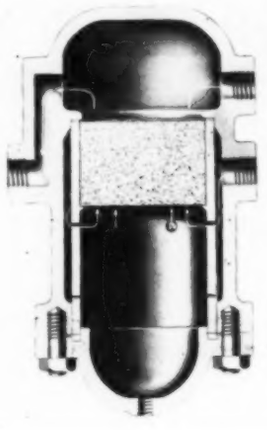
Portable Impinger

Mine Safety Appliances Co., Braddock, Thomas and Meade streets, Pittsburgh, has introduced a small impinger which, it is claimed, provides convenient portability with easy hand operation in making dust

samples. The impinger samples at the rate of 1/10 of a cubic foot per minute and is operated by a positive acting, 4-cylinder pump. The pump, in conjunction with a vacuum regulator, maintains an unfluctuating suction regardless of minor variations in the rate or smoothness of cranking. The apparatus is contained in a compact case and weighs less than 10 pounds complete with nine calibrated glass sampling tubes.

Air Filter

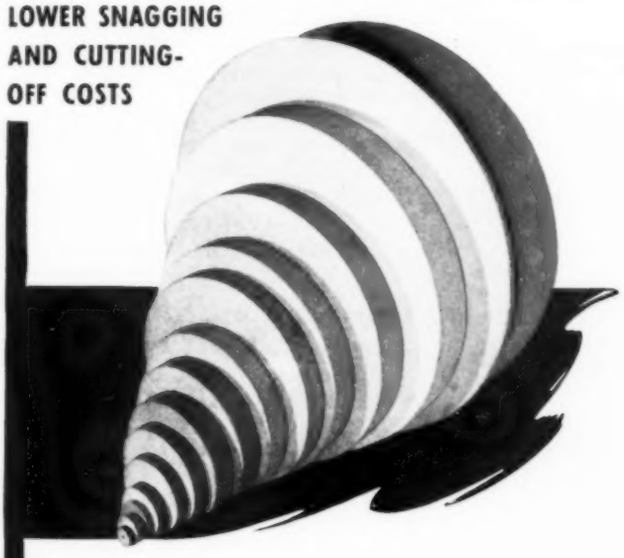
Fisher Governor Co., Marshalltown, Iowa, has introduced a new filter for gas and air lines. The filter utilizes extremely hard aluminum oxide crystals bonded together



as a filter element. This especially manufactured filter element is both acid and heat resisting and unusually strong, according to the manufacturers. Gas passes through this porous filter with only slight

MANHATTAN ABRASIVE WHEELS

LOWER SNAGGING AND CUTTING-OFF COSTS



ENGINEERED for the task after careful study of conditions, Manhattan Abrasive Wheels grind accurately . . . wear evenly at high speed . . . to do your job at lowest cost. Consult our

ABRASIVE WHEEL DEPARTMENT

THE MANHATTAN RUBBER MFG. DIVISION
OF RAYBESTOS-MANHATTAN, INC.
Executive Offices and Factories, 77 Townsend Street, Passaic, N. J.

LEAKPROOF AIR VALVE

Saves Air - Low Maintenance
Positive Air Control with Ease

MADE OF BAR BRASS and STAINLESS STEEL

Only Air-O-Chek Valves have the enclosed actuating lever connected to valve by ball and socket joint.

A Marvel of Simplicity

No packing glands. No external buttons or levers. Leakproof. Controls air with matchless efficiency from slight discharge to full blast with slight pressure between thumb and finger. All operating parts enclosed. THOUSANDS IN USE IN LEADING PLANTS. Order sample on 30 days approval.

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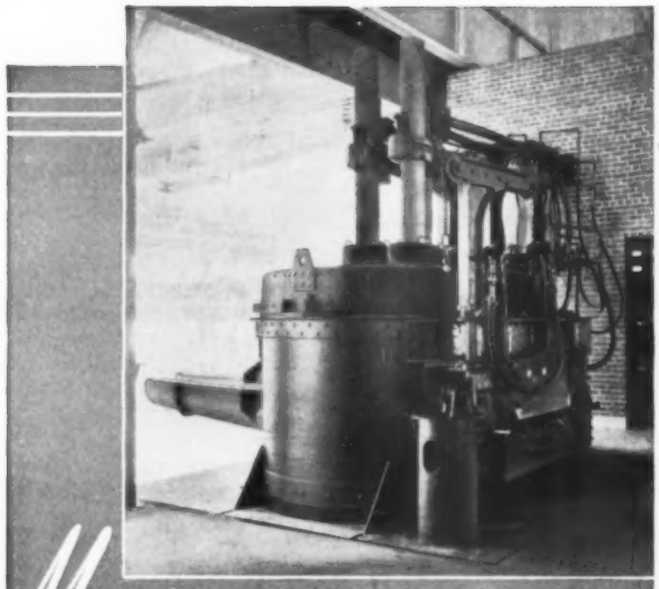
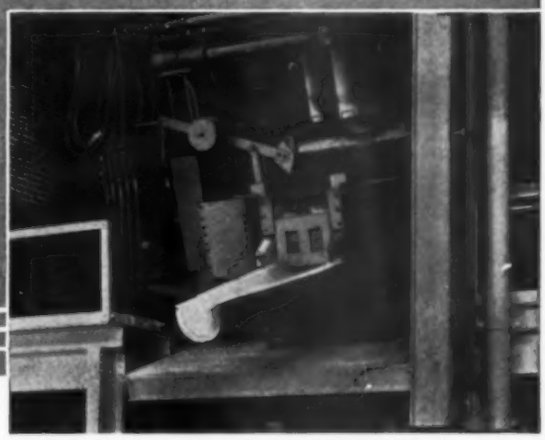
625F WEST JACKSON BLVD. CHICAGO, ILLINOIS



Modern IMPROVEMENTS IN Heroult ELECTRIC FURNACES



TYPE 1½ *Heroult Electric Furnace showing floor tilting, copper tubing, and wedge type electrode holders.*

FOUR major innovations make Heroult Electric Furnaces more efficient than ever —

Floor attached to shell tilts with furnace.

Water-cooled copper tubing, with suitable separation from mast arms, carries current to electrodes to prevent hysteresis and eddy current losses.

Improved wedge type electrode holders.

Lightweight welded roof coolers.

Heroult Electric Furnaces have gained a remarkable reputation for efficient melting and refining of all kinds of ferrous materials by basic or acid process—including alloy, tool and forging steels, iron and steel castings. Any capacity from ½ ton to 100 tons; removable roof, chute, machine or hand charging.

AMERICAN BRIDGE COMPANY

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Detroit Duluth Minneapolis New York Philadelphia St. Louis

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United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

loss due to friction during passage.

The filters may be installed in either the vertical or horizontal pipe lines with standard pipe fittings. Free moisture is separated before the gas passes through the element. This reduces the load and results in longer service life and less frequent cleaning. The filter body is constructed of high tensile iron.

Annealing Boxes

American Manganese Steel division, American Brake Shoe & Foundry Co., Chicago Heights, Ill., has taken over the manufacture of the sectional heat treating boxes. The box is designed to prolong the life of a device exposed to rather brutal treatment from high temperatures, variable temperatures during the heating cycle, etc.

The boxes are made of a special alloy in the grade best adapted to meet particular requirements. Ends, sides, bottoms and covers are cast separately. Tongues on the side members fit into vertical grooves in the ends. Matched slots in tongue and groove hold pins to prevent relative vertical movement, but do not prevent horizontal movement. Distortion and cracking is avoided by providing sufficient clearance between tongue and groove. Corrugations in the castings impart added strength at high temperatures. Light cast covers corrugated or flat replace the old style bottoms cast integral with the box. Special bottoms in which the edges fit into grooves in the lower edges of the end plates are available where the box and contents are to be lifted as a unit.

Hoist

Wright Mfg. division, American Chain Co., Bridgeport, Conn., has placed on the market a lightweight, wire rope electric hoist in models with capacities ranging from 250 to 750 pounds and hoisting speeds from 15 to 43 feet per minute.

Standard construction includes

fully enclosed ball-bearing motor, antifriction bearings, cut alloy steel spur gears, multiple disk solenoid brake, pushbutton control, preformed hoisting cable, etc. Hoist is made in three types for lug suspension, hook suspension or mounted on trolley.

Welding Rods

Compressed Industrial Gases Inc., 221 North LaSalle street, Chicago, has introduced two new bronze welding rods which are flux-coated throughout the length. It is claimed that this controls the even introduction of the chemical correct flux throughout the entire brazing operations, prevents the weld from getting too much or too little bond, and shields the molten metal from the time weld area is tinned until the job is completed. The bronze rods are designed for application to any type of bronze welding and the manganese bronze rods are specially designed for welding cast iron.

...tells the Story

Translated into terms of pounds of metal removed per pound of wheel wear, number of pieces or total tonnage ground per wheel . . . the fast cutting action of ABRASIVE COMPANY SNAGGING WHEELS means increased production and lower costs in cleaning castings and billets.

U. S. Patent 2,121,656

RED STREAK FLANGES

A new patented feature for resinoid bonded wheels for swing frame and floor stand grinders . . . consisting of two circular steel flanges or plates embedded into the wheel around the center hole . . . provides better fit, truer running, less wear, etc. No extra charge. Write for details.

SIMONDS Famous Family of METAL CUTTING TOOLS

TRADE ABRASIVE MARK REGISTERED

ABRASIVE COMPANY
Division of Simonds Saw and Steel Co.
Tacony and Fraley Sts., Philadelphia, Pa.
Chicago Branch: 1624 South Western Avenue

Four Letters

● **From a Pipe Foundry:**

"We are happy to say that the Clearfield Mixer is serving our purpose nicely and we are entirely satisfied with it."

● **From a Jobbing Shop:**

"We have nothing but praise for this machine. We have been able to eliminate one man since its installation."

● **From a Machinery Manufacturer:**

"We doubt if the second mill will be needed for the iron foundry, as the first is turning out all the sand we can use and doing a fine job."

● **From a Steel Foundry:**

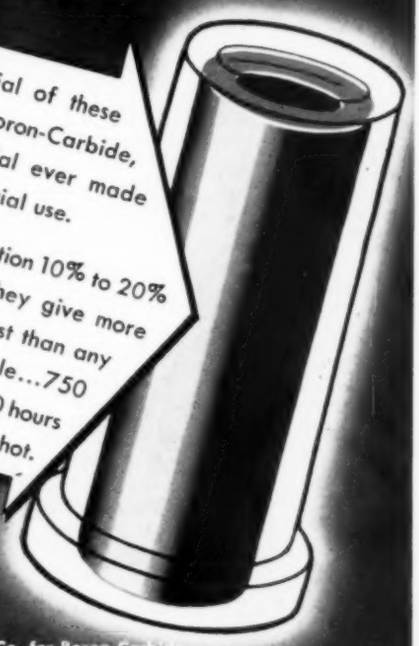
"This machine has proved very satisfactory. It does a good mixing job and we are glad we bought it. We can recommend it highly."

CLEARFIELD MACHINE CO.
Clearfield, Pennsylvania

PANGBORN-NORBIDE*
LONG-WEAR BLAST CLEANING NOZZLES

The lining material of these nozzles is Norton Boron-Carbide, the hardest material ever made by man for commercial use.

Decrease air consumption 10% to 20% over iron nozzles. They give more service per dollar cost than any nozzle now available...750 hours with sand, 1500 hours with steel grit and shot.



Guarantee—
1500 Hours with Steel Abrasive—
750 Hours with Sand

*Trade-mark of Norton Co. for Boron Carbide

PANGBORN
The World's Largest Manufacturer of Blast Cleaning and Dust Collecting Equipment
HAGERSTOWN - - - - - MARYLAND

MORE WORK DONE IN LESS TIME WITH THESE *Lighter* CORE PLATES

● Production capacity takes a sharp rise when you use J-M Transite Core Plates. They weigh only one-quarter as much as metal of equal thickness . . . one foundry worker can easily handle twice the load. Cracking, breaking and warping are practically eliminated because Transite Core Plates are unusually strong and durable. And their tough asbestos-cement composition offers exceptionally high resistance to corrosion . . . assures longer life in any service. Why not get all the facts? Write for brochure PP-3A, Johns-Manville, 22 E. 40th St., New York, N.Y.

JM *Johns-Manville*
TRANSITE CORE PLATES

Swing Grinder

F. B. Shuster Co., New Haven, Conn., recently has developed a motor driven, suspended, swing frame grinder, as shown in the accompanying illustration. Designed for operation on heavy castings the device is available in three sizes. The smallest carries a wheel 16 inches diameter, 3 inches wide. The largest size will take a grinding wheel 24 inches diameter and 3 inches in width.

The machine is driven by V-belts and the motors range in capacity for 5 to 15 horsepower. Motors may be standard totally enclosed, dust

proof, alternating or direct current type. Supported on a swiveling yoke the device may be swung through a complete circle. It may be tilted so the wheel spindle is inclined at angles up to 90 degrees from the horizontal. The balance is maintained in all positions and the machine may be locked at the required angle through a clamping attachment actuated from the operating position. Grinding wheel runs on fully enclosed heavy duty ball bearings, readily accessible for replacement. The smallest machine, 5 feet 5 inches centers, overall length 96 inches including the handles and a width of 22 inches, weighs approximately 700 pounds with an alternating current motor and 800 pounds with a direct current motor.

Welders Glove

Industrial Gloves Co., 711 Garfield boulevard, Danville, Ill., recently introduced a new chrome tanned leather glove incorporating several unusual features of particular interest to welders. The gaunt-

let has one piece back extending from knuckles to top edge of gauntlet, eliminating seams on back. Leather used is of special chrome tannage, which is said to resist shrinkage and hardening to a maximum degree and keeps glove soft and flexible under severe temperatures. The glove is cut on extra full pattern to insure cool, comfortable protection at all times.

Book Review

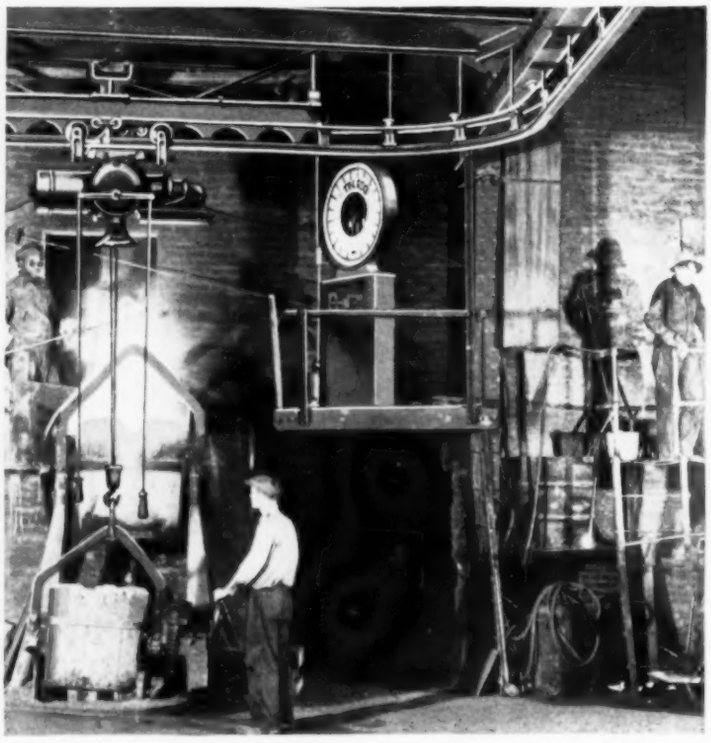
Adjusting Your Business to the New Legislation, prepared by Leo M. Cherne, published by the Tax Research Institute of America, Inc., New York, and supplied by THE FOUNDRY, Cleveland, for $12.85.

The new handbook is designed to show how trouble can be avoided by knowing in advance what steps to take with regard to each one of the federal and state laws that now regulate wages, hours, labor standards, selling policies, prices, discounts, and other business practices. Included in the laws explained in the handbook are the Wage and Hour law, Labor Relations act, Pure Food and Drug act, Federal Trade Commission act, Robinson-Patman act and other regulatory measures. Scientific recommendations are offered on the steps that should be taken to comply with each law most conveniently and economically.

The handbook is a looseleaf volume of 1065 pages supplied in a 5-ring binder. The tabs indicate various divisions and the entire work carries an extensive index.

CLEVELAND TRAMRAIL

OVER HEAD HANDLING EQUIPMENT



● Large as well as small ladles are transported to the floor and poured direct from the Cleveland Tramrail System. Weight is conveniently determined from the overhead track scale built tnto the tramrail system.

ALSO BUILDERS OF CLEVELAND CRANES ALL WELDED

CLEVELAND TRAMRAIL

DIVISION OF

THE CLEVELAND CRANE & ENGINEERING CO.

1155 Depot St.

WICKLIFFE, OHIO.

Or Consult Your Phone Directory under Cleveland Tramrail

The Ideal Material for Sand Blasting

. . . . . it cleans fast
. . . . . *at reduced cost*

FLINT SHOT gives a class of finish impossible to duplicate with any other forms of abrasives. Its round, pearlike granules are as hard and sharp as flint. Does not split up, only wears down and can be used over and over again many times. It flows freely, requiring less air power. FLINT SHOT LASTS. Relatively dustless.

Try FLINT SHOT and you'll be convinced.

Engineering Service Gratis.

Three plants to meet your needs with dispatch.

Washed, Dried and Screened Special Sands for
Steel Moulding
Furnace Bottoms
Cores, Openers
And Silica Flour

OTTAWA SILICA COMPANY

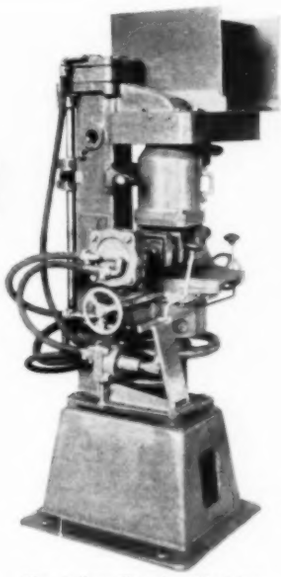
Ottawa, Illinois

THE NEW No. 0

CORE BLOWER

designed for small core work, such as brass plumbing goods and small fittings.

Fast—easy to use—economical in first cost and repairs.



No. 0 Core Blowing Machine

Write for Specifications and Price

CORE BLOWERS FOR ALL REQUIREMENTS

WM. DEMMLER & BROS.
KEWANEE, ILLINOIS

SCIENTIFIC MATCH PLATES
Pressure Cast

for ACCURATE CASTINGS

WRITE FOR LITERATURE

You GET
Accurate Partings,
True Reproductions,
Lower Pattern Costs.

You SAVE
Expensive Pattern Duplication,
Excessive Cleaning Costs.

You AVOID
Center Shrinks,
Draws at Parting.

The SCIENTIFIC CAST PRODUCTS Corp.
1388-1392 E. 40th St., CLEVELAND, O.
505-507 S. Western Ave., CHICAGO, ILL.

OBITUARY

HENRY V. WILLIAMS, 70, for the past 35 years foreman of the general pattern department, National Malleable & Steel Castings Co., Cleveland, died recently in that city.

* * *

Arthur C. Swallow Sr., 68, founder and president, Motor Casting Co., Milwaukee, died April 11.

* * *

Charles Benjamin Coates, electrical engineer for the Chicago Pneumatic Tool Co., Cleveland, died March 17. Mr. Coates was born in Erie, Pa., was a graduate of Cornell university and a member of the Institute of Electrical Engineers.

* * *

Walter J. Miller, president, Keokuk Steel Casting Co., Keokuk, Iowa, died May 21 in California.

* * *

Robert M. Rubush Sr., 47, for many years metallurgist, Machine Steel Casting Co., Alliance, O., died recently.

* * *

H. E. McClumpha, died at his home in Bellevue, Pa., on May 13. A former executive of Keystone Car Wheel Co. and its successor, Southern Wheel Co., Mr. McClumpha's invention of the continuous method of casting chilled iron wheels on movable platforms, accurately timed for the heat treatment cycle, has become standard practice in the industry. At the time of his retirement in 1930 he was vice president of Southern Wheel Co.

* * *

George Carter Miller, 64, president, Dodge Mfg. Corp., Mishawaka, Ind., maker of power transmission equipment died in that city on May 10.

* * *

J. Watson Long, 77 formerly president of the Mahoning Foundry Co., Youngstown, O., died recently at the home of his daughter in Warren, O.

PERSONALIZED
PIG IRON

If you think that pig iron can not have any "personality", you're dead wrong! Sloss pig iron has personality—plenty of it.

The reason is twofold. First, Sloss furnace men are steeped in a tradition that Sloss foundry pig iron is made to be used for the sole purpose of making good castings. They consider Sloss foundry iron a particular raw material, having no connection with steel. They are "foundry iron conscious" with the result that Sloss pig iron has a distinct "foundry personality".

Second, Sloss Service men urther *personalize* Sloss pig iron by practical shirt-sleeve cooperation with your own foundry staff so that the matchless ladle-mixed-uniformity, quality and advantages of Sloss iron may be fully utilized. Address inquiries to

Sloss-Sheffield Steel & Iron Company
Birmingham, Alabama

SHIRT SLEEVE SERVICE

SLOSS
SPECIALISTS IN FOUNDRY IRON
LADLE-MIXED FOR UNIFORMITY

Book Review

Key to Recovery, by Russell Weisman, 147 pages, published by the North American Publishing Co., Cleveland and supplied by THE FOUNDRY, Cleveland for $1.50 and in Europe by the Penton Publishing Co., Ltd., London.

This interesting discussion of certain present economic problems is prepared by an associate professor of business and economics of Western Reserve university, Cleveland, and also associate editor of the *Cleveland Plain Dealer*. The study begins with the banking crisis in 1933 and analyzes the various major recovery and reform policies which have marked the New Deal.

As those who have followed the daily comments of Professor Weisman must know, he is considerably concerned over the failure of the recovery of 1936 to carry through. It is his opinion that the policies undertaken by the government and designed to stimulate private enterprise have had the opposite effect and resulted in a depression.

The author offers a program considerably opposed to that now in force. He believes in abandoning government managed economy in favor of free private enterprise.

Lubrication

A new, free flow, large alemite button head fitting, designed to speed up lubrication of heavy machinery, has been developed by the Stewart-Warner Corp. In the new fittings, the usual core valve has been replaced with one having a flat face and seat which, when open, offers practically no impediment to the free flow of lubricants. By expanding the diameter of the valve retaining spring, lubricant flows through the center of the spring and not through its compressed coils.

Gray Cast Iron

BY JOHN W. BOLTON

An outstanding, new book which presents in detail all of the latest developments in raw materials, practices, metallurgy and engineering properties of gray iron castings. The author, John W. Bolton of the Lunkenheimer Company, Cincinnati, Ohio, is a recognized authority on these subjects.

Twenty-two chapters discuss such phases of gray iron foundry practice as melting processes, casting defects, design, effects of regular and alloying elements, superheating, heat treatment, physical properties, machinability and wear, effect of temperature on mechanical properties, corrosion, and specifications.

Clearly and simply written, *Gray Cast Iron* is easily understood, even by beginners.

• • •

Bound in dark red cloth, heavy board cover, cross indexed for easy reference. Contains 400 pages, 262 illustrations on high grade book paper. Attractively printed and arranged.

Price $5 Postpaid

A BOOK FOR THE LIBRARY OF EVERY GRAY IRON FOUNDRYMAN

THE PENTON PUBLISHING COMPANY
Penton Building, Cleveland, O.
Enclosed is $5* for which please send postpaid, one copy of GRAY CAST IRON by John W. Bolton.

Name _____

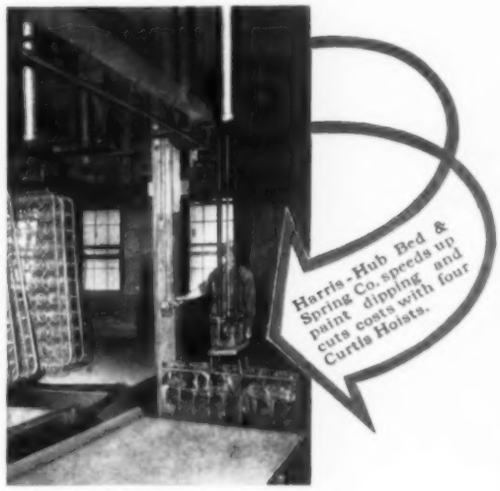
Address _____

City _____ State _____

*Add 3% Ohio Sales tax on Ohio orders 200-F

75% Time Saving

WITH CURTIS AIR HOISTS



Eighteen months ago the Harris-Hub Bed and Spring Company installed four Curtis Air Hoists to replace hand-operated windlasses for dipping bed springs in paint baths. The result was a 75% saving in time. Not a cent has been spent to date for repairs, although the hoist illustrated is used about 250 times a day. Curtis Air Hoists were chosen because of their low cost, rugged simplicity and smooth operation.

Your plant probably has one or more jobs which can be done more efficiently and at less expense with Curtis Air Hoists. First cost is little more than a chain block. Installation is easy, and regular shop air lines are used. Curtis Air Hoists are immune to injury from overloads or bad atmospheric conditions, power consumption is small and maintenance negligible. They can be operated with ease and accuracy by unskilled labor. Capacities from ¼ to 10 tons.

Check your plant to see where you can save money with Air Power. Send coupon below for our booklet, "How Air is Being Used in Your Industry."

CURTIS

Compressors • Air & Hydraulic Cylinders
Air Hoists • I-Beam Cranes & Trolleys

CURTIS PNEUMATIC MACHINERY COMPANY
1922 Kienlen Avenue, St. Louis, Missouri
Gentlemen: Please send me your booklet, "How Air is Being Used in Your Industry," and further information on Curtis Air Hoists.

Name _____

Firm _____

Street _____

City _____ State _____

FOUNDRY ACTIVITIES

HOBART MFG. CO., Troy, O., has awarded contracts for design and construction of the 3-story reinforced concrete plant addition and a new brass foundry at Troy to the Austin Co., Cleveland.

* * *

J. R. Clancy Inc., 1008 West Belden avenue, Syracuse, N. Y. is in the market for sashweight material cast in oblong weights 12 to 21 pounds.

* * *

City Brass & Aluminum Co., 426 South Pennsylvania street, Indianapolis, announces reorganization. The personnel consists of Ray S. Carson, president and general manager of the foundry; Francis M. Jones, vice president and secretary, Adrian M. Greene, treasurer and M. P. Schaefer and J. J. Mitchum of Mitchum & Schaefer Inc.

* * *

Pittsburgh Gray-Iron Foundry Co.'s plant was damaged by fire recently at an estimated total more than $1,000,000.

* * *

J. P. Ward Foundry Co., Blossburg, Pa., C. B. Ward, president, is taking bids for rebuilding its foundry at cost of $100,000.

* * *

Improvements have been made at the plant of the Hanford Foundry Co., 109 South Arrowhead avenue, San Bernardino, Calif. R. P. Drummond is the owner.

* * *

A certificate to conduct business under the firm name of Glendale Foundry & Alloy Co., 4900 San Fernando road, Glendale, Calif., has been issued to the owner, William Eckardt. This company formerly was the Glendale Foundry Works.

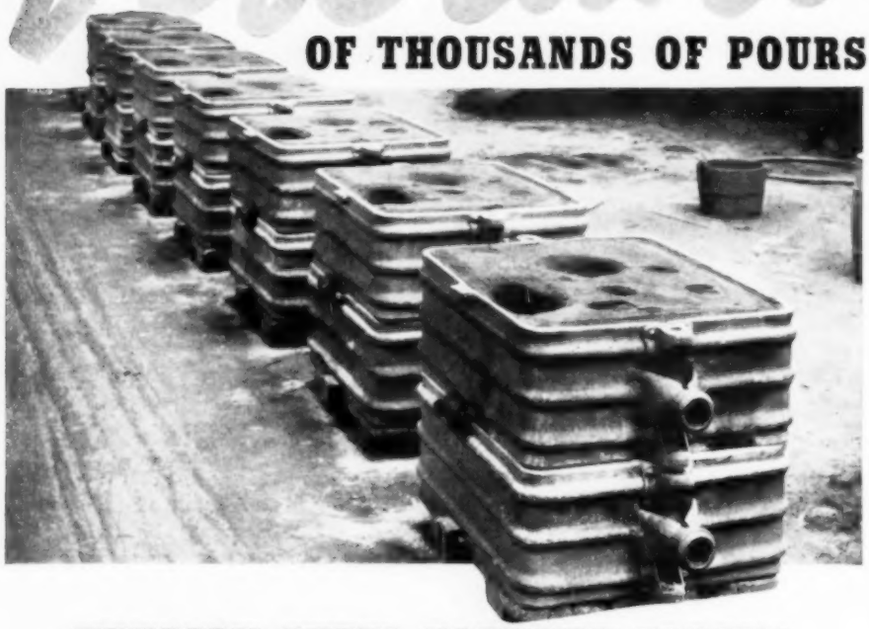
* * *

Bullock's Foundries, Inc., Los Angeles, Calif., recently was organized with 20,000 shares of capital stock. Directors are: A. J. Bullock, West Los Angeles; William W. Jones and

(Concluded on page 130)

Veterans

OF THOUSANDS OF POURS



TRUSCON STEEL FOUNDRY FLASKS SURVIVE YEARS OF ACTIVE SERVICE

The Truscon Flasks illustrated have been rammed, poured and shaken out thousands of times and are ready for more. Maintenance costs have averaged only a few cents per year per flask. You can get that kind of service plus all other advantages of light weight and super-strength when you standardize on Truscon Copper-Bearing Steel Foundry Flasks. *Write for complete catalog.*

TRUSCON STEEL COMPANY • FOUNDRY FLASK DIVISION

6100 TRUSCON AVENUE • CLEVELAND, OHIO

Subsidiary: Republic Steel Corporation

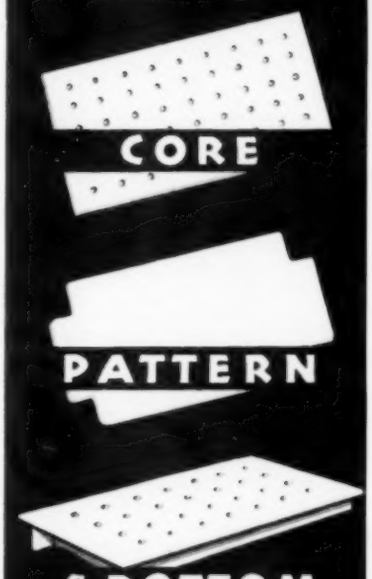
TRUSCON

COPPER-BEARING STEEL FOUNDRY FLASKS

RAW MATERIAL PRICES
May 24, 1939

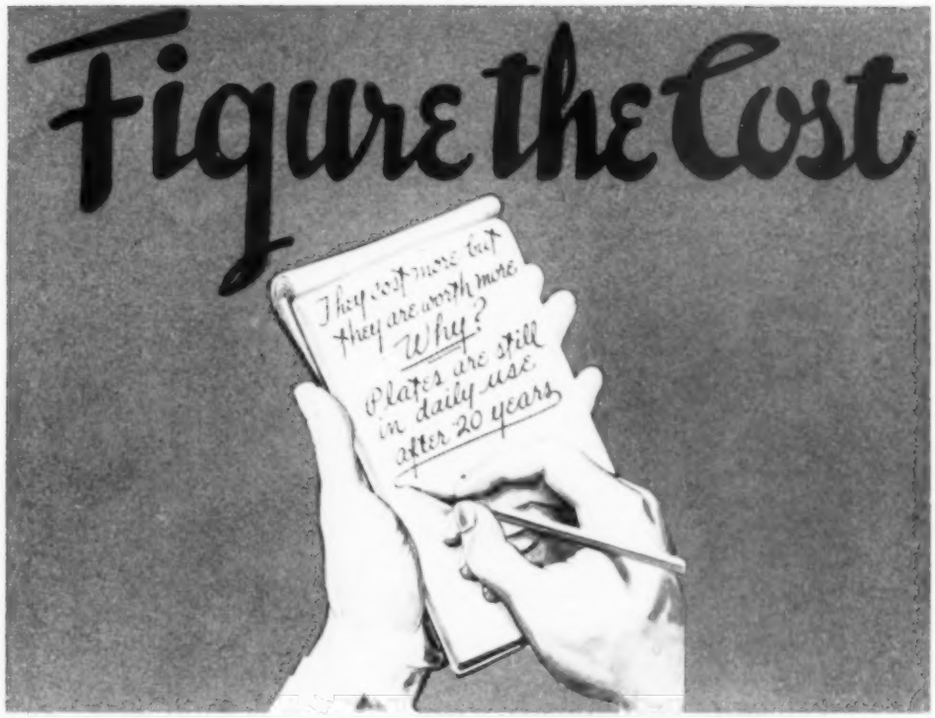
Iron	
No. 2 foundry, Valley	$21.00
No. 2 Southern Birmingham	17.00
No. 2 foundry, Chicago	21.00
No. 2 foundry, Buffalo	21.00
Basic, Buffalo	20.00
Basic, Valley	20.50
Malleable, Chicago	21.00
Malleable, Buffalo	21.50
Charcoal iron, furnace	25.00
Coke	
Connellsville beehive premium	$5.50 to $6.50
Wise county beehive coke	5.00 to 5.25
Detroit by-product delivered	10.25
Scrap	
Heavy melting steel, Valley, No. 2	$13.00 to $13.25
Heavy melting steel, Pittsburgh, No. 2	13.00 to 13.50
Heavy melting steel, Chicago, Auto No. 2	10.50 to 11.00
Stove plate, Buffalo	11.50 to 12.00
Stove plate, Chicago	7.50 to 8.00
No. 1 cast, mchy., New York	11.00 to 11.50
No. 1 cast, mchy., Chicago	12.00 to 12.50
No. 1 cast, Pittsburgh	14.50 to 15.00
No. 1 cast, Philadelphia	16.00 to 16.50
No. 1 cast, Birmingham	14.00 to 14.50
Car wheels, iron, Pittsburgh	14.50 to 15.00
Car wheels, iron, Chicago	13.00 to 13.50
Railroad malleable, Chicago	14.50 to 15.00
Malleable, Buffalo	13.50 to 14.00
Nonferrous Metals	**Cents per pound**
Castings copper, refinery	9.62½
Straits tin	48.70
Aluminum, 99 per cent	20.00
Aluminum, No. 12 (Secondary, standard)	12.25 to 12.50
Lead, New York	4.75
Antimony, New York	11.75
Nickel, electro	35.00
Zinc, East St. Louis, Ill.	4.50

MOLTRUP



& BOTTOM PLATES

Figure the Cost



MOLTRUP STEEL PRODUCTS COMPANY

Sales Offices in All Principal Cities BEAVER FALLS, PA. (Pittsburgh District)

MOLTRUP

Foundry RIDDLES

HERE is a foundry riddle that will stand the "gaff" because it has been constructed and *designed especially for foundry use.* "Buffalo" riddles are noted for long life and the ability to do faster, cleaner work. It will pay you to try *Buffalo's* the next time you buy riddles.

Available in three stock sizes: 16", 18" and 20" diameter with mesh of either steel, galvanized, tinned or brass wire cloth, supported by two, three or four wires as specified. Ask Us For New Folder No. 91-B

"We are not connected with any other wire weaving company in New York State or any other part of the United States."

Buffalo WIRE WORKS Co., Inc.

425 TERRACE, BUFFALO, NEW YORK

Branch Office & Warehouse: 11 South 7th St. Philadelphia, Pa.

COLEMAN

CORE AND MOLD OVENS

This battery of two Coleman mono-rail type core ovens was designed to meet the requirements of The Standard Stoker Company, Inc., Erie, Pa. This customer reports fine uniformity and a considerably shorter bake than with former equipment.

Coleman Ovens quickly pay for themselves wherever they are installed. Coleman engineers will gladly recommend the best type ovens to handle your work dependably at the lowest possible cost for fuel and labor.

Why waste money with obsolete baking equipment?

WRITE FOR COMPLETE CATALOGS

The FOUNDRY EQUIPMENT CO.

• COLEMAN AND SWARTWOUT OVENS •

CLEVELAND, OHIO

(*Concluded from page* 128)

D. Webster Egan, Los Angeles. The new organization is represented by D. Webster Egan, attorney.

* * *

Kinney Iron Works, 2525 East Forty-ninth street, Los Angeles, is establishing a new and modern bronze foundry under the direction of James E. Eppley, superintendent, to specialize in high quality nonferrous castings.

* * *

Index of foundry equipment orders for April, according to a report of the Foundry Equipment Manufacturers' association, Cleveland, was 146.0 as compared with 146.6 in March and 79.3 in April, 1938. Index of shipments was 131.0 as compared with 128.1 in March and 93.4 in April, 1938.

* * *

Meehanite Metal Corp., Pittsburgh, recently has established a subsidiary company known as the South African Meehanite Metal Co. Ltd., Johannesburg, South Africa, organized to grant manufacturing rights for meehanite metal to South African concerns. East Rand Engineering Co. Ltd., and Wright-Boag & Co. Ltd., of Transvaal, have been licensed to manufacture the metal.

Remember when
STEARNS set the pace in scientific magnetic pulley construction back in 1917?

Remember when
STEARNS introduced air cooling in magnetic pulley construction back in 1922?

Remember when
STEARNS introduced the unit one-piece integrally cast magnet body back in 1924?

Remember when
The peak loads carried by conveyor belts were made possible because of the deep, strong magnetic field provided by STEARNS HIGH DUTY Magnetic Pulleys?

STEARNS HIGH DUTY Magnetic Pulleys incorporate features which are basic in principle and magnet design. Each detail contributes to the maximum magnetic density, depth of field, uniform flux distribution and a scientific application of the elements used.

Magnetic pulleys today are as important as the conveyor in which they are used. In the STEARNS HIGH DUTY Magnetic Pulleys there is always sufficient magnetic power in reserve to handle a peak load.

Progress is born of experience and experience is your best protection. STEARNS has been building magnets for thirty-eight years. Does this mean anything to you?

FOR COMPLETE INFORMATION AND DETAILS WRITE FOR BULLETIN NO. 301.

STEARNS MAGNETIC MFG. CO.
SEPARATORS DRUMS ROLLS CLUTCHES BRAKES MAGNETS
Formerly Magnetic Mfg. Co. HIGH STEARNS DUTY
LARGEST EXCLUSIVE BUILDERS OF MAGNETIC EQUIPMENT
662 So. 28th Street Milwaukee, Wis.

Trade Publications

SAND TESTING—Harry W. Dietert Co., 9330 Roselawn avenue, Detroit, has published a 110-page booklet describing its foundry sand testing and control equipment. The booklet is divided into four sections of which the first is devoted to detailed descriptions and illustrations of equipment, the second gives prices, the third covers operating instructions, and the fourth is concerned with technical data. The latter section describes common sand defects, and their remedies.

ABRASIVES—Norton Co., Worcester, Mass. has printed a folder in color illustrating and describing its new metal bonded diamond wheel.

COUPLINGS—Falk Corp., Milwaukee, has issued a 4-page folder No. 4630 describing the engineering principles of its controlled torque steelflex couplings. Schematic drawings and specification table are included with the text.

SPEED REDUCERS—Speed reducers used with electric motors and gas, oil or diesel engines are extensively described in an illustrated booklet, published by the Nuttall Works, Westinghouse Electric & Mfg. Co., Pittsburgh.

CHEMICALS—Glyco Products Co. Inc., 148 Lafayette street, New York, has issued a catalog describing synthetic materials made in its laboratories. Suggestions as to uses for the various materials are made and formulas given. The catalog has 71 pages and is indexed.

PORTABLE TOOLS—Foredom Electric Co., 27 Park place, New York, has published a folder describing its portable work shop, flexible shaft tools, and various accessories. The folder is well illustrated with views of the portable work shop and the tools and accessories.

Copies of any of the literature listed here may be obtained by writing directly to the companies involved, or by addressing THE FOUNDRY, in care of Readers' Service Department, 1213 West Third Street, Cleveland

FLOOR SURFACER — Flexrock Co., 2300 Manning street, Philadelphia, has issued a folder describing the properties and application of its new product, roxite. The compound is described and a formula given for the resurfacing of worn floors.

GEARMOTORS—Gearmotors, self-contained drives consisting of a high speed motor and necessary speed reducing unit are illustrated and discussed in a booklet, recently published by the Nuttall Works, Westinghouse Electric & Mfg. Co., Pittsburgh.

POTENTIOMETER CONTROLLERS—A 24-page illustrated bulletin No. 202-2, has been issued by the Foxboro Co., Foxboro, Mass. devoted to the description of the construction features of the controllers as well as illustrating their installations on typical applications.

SHOES—Lehigh Safety Shoe Co., Allentown, Pa. has issued an 8-page booklet illustrating the various types of shoes and boots manufactured by that company for industrial use. Cutaway illustrations show the construction of the shoes and the safety features.

CRANE EQUIPMENT—Harnischfeger Corp., 4400 West National avenue, Milwaukee, has published bulletin C-5 describing all electrical equipment necessary for modern crane operation. It covers descriptions of full magnetic re-

(*Continued on page* 132)

SNOWDEN SAMUEL, *Pres.* S. A. COCHRAN, *Vice Pres.*

FRANK SAMUEL & CO., Inc.
Harrison Bldg., Philadelphia, Pa.

PIG IRON
Low Phos—English—French

ALLOYS
Ferro Manganese Silico Manganese
Ferro Silicon Ferro Chrome
Calcium Silicide
Calcium Manganese Silicon

MANGANESE ORE
Open Hearth Use—Blast Furnace Use

CHROME ORE
Lump—Ground

IRON ORES
Foreign

BRANCH OFFICES:
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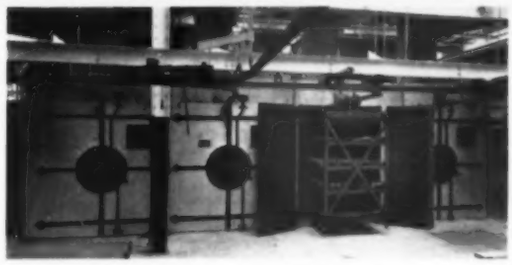

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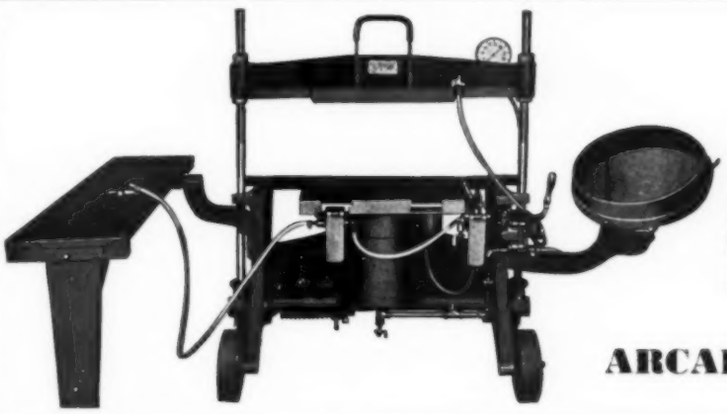

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(*Continued from page* 130)

generative control, counter torque hoist control and full magnetic direct current and alternating current control as well as protective panels, limit switches, etc. Bulletin C-6 covers design and application of the cranes produced by that company.

VALVES—Bulletin No. 214-1, 27 pages, describing controller valves manufactured by the Foxboro Co., Foxboro, Mass. has been issued recently by that company. Specifications for the various types of valves, diagrams of their construction and their application are included.

STOCK LIST—Scully Steel Products Co., subsidiary of the United States Steel Corp., 1319 Wabansia avenue, Chicago, has issued a stock list and reference book for 1939. It lists completely all the stock carried in the company's warehouses throughout the country and a ready thumb index makes all items easily found.

LIFTS—Rotary Lift Co., 1055 Kentucky street, Memphis, Tenn., has issued a booklet illustrating the uses of its levelators and tabelators, as well as giving details on the operation of the equipment.

ABRASIVE—Abrasive Co., Philadelphia, has issued a folder describing the uses of borolon, an aluminum oxide abrasive grain for the polishing trade. Its properties are described, the various types of abrasives illustrated and instructions for its application given.

REFRACTORIES — Harbison-Walker Refractories Co., Pittsburgh, recently issued a folder discussing its high heat and moderate heat fireclay brick, and silica brick. The folder describes the material used in the brick, lists the uses for the various types and gives the available stocks.

GRINDERS—Chicago Wheel & Mfg. Co., 1101 West Monroe street, Chicago, has issued a 62-page catalog for Handee electrical tools. Illustrations of applications for the various units and their accessories are given.

ALLOYS—International Nickel Co., 67 Wall street, New York recently issued the revised edition of "Iron-Nickel Alloys for Magnetic Purposes." Tables, diagrams and charts supplement the text.

MOTORS—A line of explosion proof electric motors is described in bulletin 508E recently issued by Louis Allis Co., 337 Curtis building, Milwaukee. All construction details are illustrated and described.

GAGES—Foxboro Co., Foxboro, Mass. has issued an 8-page booklet No. 229 describing its pressure type indicating gages. Cross-sectional illustration of mechanical construction together with descriptions of assembly are included.

INDICATORS—Catalog issued by the Leeds & Northrup Co., 4907 Stenton avenue, Philadelphia describes its manually-operated indicators for thermocouple temperatures. The indicators are either portable or for switchboard mounting.

MOTORS—Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., recently has issued booklet B-2164 giving application data, including the more important synchronous motor applications and their typical torque requirements on its line of synchronous motors.

POWER TOOLS—Walker-Turner Co. Inc., Plainfield, N. J., has issued catalog G-9 of 47 pages giving specifications and illustrations on its line of power tools. Also included are several pages devoted to the company's motors and accessories for their many types of equipment.

CONVEYOR—A 24-page illustrated catalog, No. 1720, has been published by Link-Belt Co., 307 North Michigan avenue, Chicago on its overlapping pivoted bucket carrier for handling, elevating, conveying coal, ashes, stone, cement, clinker, Fulier's earth, phosphate rock and other materials.

INSULATOR — Quigley Co. Inc., 56 West Forty-fifth street, New York, has issued a folder discussing the refractory properties of insulcrete, a light weight cellular insulating refractory, and lists its uses. Other products manufactured by that organization also are described.

CONVEYOR—Catalog No. 1630, published by the Link-Belt Co., 207 North Michigan avenue, Chicago, illustrates the flexibility of overhead conveyors by pictures of its wide application. Cores can be transported, castings cleaned and other operations performed by overhead transportation.

THERMOMETERS—Catalog No. 1170 of 17 pages recently was issued by C. J. Tagliabue Mfg. Co., Park and Nostrand avenues, Brooklyn, N. Y. to describe its line of dial-indicating thermometers. Included are specifications and illustrations of the equipment and their application.

REFRACTORY CEMENT—Hytempite, a plastic air setting cement for bonding refractory brick and shapes, is described in catalog H. G. 501 issued by Quigley Co., 55 West 45th street, New York. Illustrations of applications, methods of application and tables for mixing the material are included.

LIGHTING—"Lighting for Production in the Factory" is the title of a 38-page book recently issued by the General

(*Concluded on page* 134)

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ADVERTISING PAGES REMOVED

(*Concluded from page* 132)

Electric Co., Nela Park engineering department, Cleveland. The book covers phases of industrial lighting, giving suggestions on types of lights, reflectors, lighting plans for various applications.

COMPRESSORS — Sullivan Machinery Co., Michigan City, Ind., has prepared a 16-page bulletin A-18 describing its line of air and gas compressors. The catalog illustrates feature construction details and a variety of installations made since the compressor was introduced.

MOTORS—A new illustrated bulletin, No. 1195, on squirrel cage induction motors has been released by Allis-Chalmers Mfg. Co., Milwaukee. Several pages of the 8-page bulletin are devoted to studies of motors which have been in operation under adverse conditions. Also included are illustrated descriptions of construction details of the motors and a table giving common types of squirrel cage motors and their applications.

CONVEYERS—Mathews Conveyer Co., 212 Tenth street, Ellwood City, Pa., has prepared a conveyer handbook for plant officials giving specifications, diagrams and suggested types of conveyers for various applications, including rollers, wheel, chute, belt, chain, and elevating conveyers. The catalog has 384 pages and is well illustrated.

BEARINGS—Johnson Bronze Co., New Castle, Pa. has issued catalog No. 390 of 72 pages which incorporates complete bronze bearing service. Indexing features facilitate selection of bearing types and sizes. Valuable information on bronze bearing alloys, tolerance and large range of sizes aids in selection of correct bearing for any application.

DUST COLLECTORS—Dust collecting equipment manufactured by Pangborn Corp., Hagerstown, Md., is described in a folder recently issued by that company. Damages due to dust are pointed out and various types of installations of dust collecting equipment are illustrated.

EQUIPMENT—Selas Gas & Engineering Co. Ltd., City road, Manchester 15, England, has issued supplementary leaflets for their catalog covering its laboratory crucible furnace, salt bath furnaces and laboratory sand bath. These leaflets give full particulars including illustrations of the equipment and specifications.

GAS BURNERS — Hauck Mfg. Co., 124-136 Tenth street, Brooklyn, N. Y., has issued catalog No. 802 of 10 pages to describe its various types of gas burning equipment. Capacity tables for the various types of gas, diagrams of construction of the different types of equipment and instructions for their use are given.

CONTROLLERS—A 48-page bulletin No. 225 recently was issued by the Foxboro Co., Foxboro, Mass. discussing factors governing choice of temperature controllers and outlines types of controllers to meet particular industrial needs. Four classes of thermal systems are discussed with listing of proper accessories for each system.

CONVEYORS—American Monorail Co., 13102 Athens avenue, Cleveland, has issued a 254-page book covering complete technical data on track, trolleys, switches, manual cranes, electric cranes, tractor carriers, elevators, buckets and grabs. It contains views of installations and more than 40 pages are devoted to technical data exclusively.

AIR CYLINDERS—Logansport Machine, Inc., Logansport, Ind., recently has issued bulletin No. 270 describing its heavy duty mill type air cylinders. Included are illustrations, drawings and specifications of the various types of cylinders and descriptions of air cleaners, air valves, and reducing valve and lubricator manufactured by the company.

CONTROL PANELS — A recent folder describes automatic control panels for industrial electric heating, published by General Electric Co., Schenectady, N. Y. It describes, illustrates and gives ratings of various automatic temperature control equipment used to control all types of heating equipment made by the company.

ELECTRICAL EQUIPMENT—General Electric Co., Schenectady, N. Y., has issued a book of 54 pages, No. GED-766, covering electrical developments of 1938. Its contents includes: Power, generation, transmission, measurement; industrial, equipment, applications; transportation, land, sea, air; domestic commercial and other applications; illumination and research.

GRINDERS—South Bend Lathe Works, 425 East Madison street, South Bend, Ind., has published a new 32-page catalog, No. 46-B, announcing a new 9-inch workshop precision lathe. The book is filled with more than 150 illustrations describing and showing different types, important features, workmanship and application of this back-geared, screw cutting, metal working lathe.

MOTOR—Louis Allis Co., Milwaukee, has issued a motor application chart, bulletin No. 515. It lists various types of motors and checks the proper type of motor recommended for approximately 50 standard applications. It also analyzes starting, maximum and full load torques characteristic of the motors, speed regulation; per cent of slip and other information compiled for ready reference.

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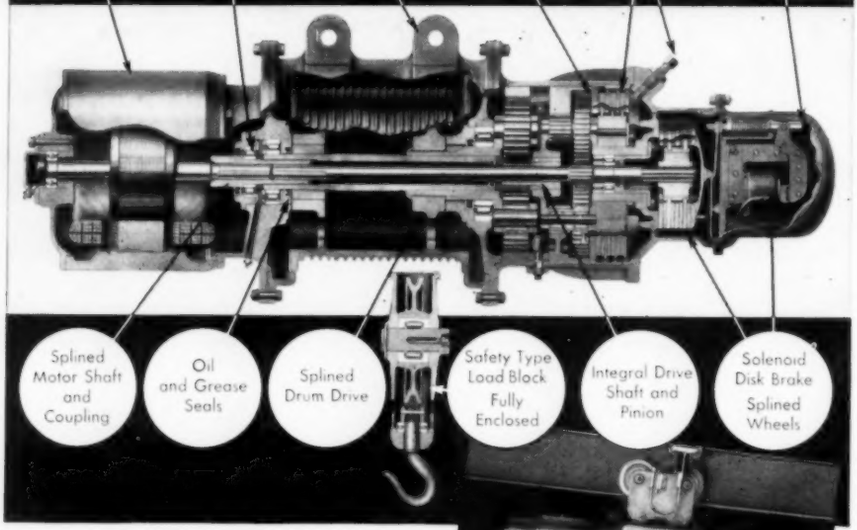

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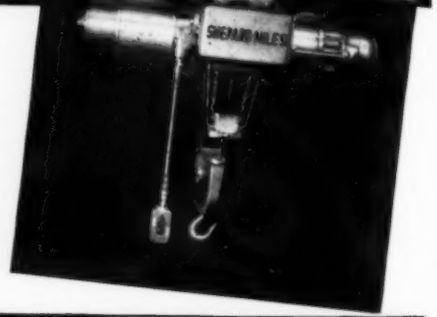

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